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SMITHVILLE PCB CLEANUP PROJECT

TAGA 6000 SURVEY RESULTS

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SMITHVILLE PCB CLEANUP PROJECT

TAGA 6000 SURVEY RESULTS

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Ministry of Environment and Energy

EXECUTIVE SUMMARY

At the request of the West Central Region the mobile TAGA 6000 unit conducted a five-phase air monitoring survey in Smithville, Ontario. The survey objective was to provide on-site near real-time ambient concentration measurements of selected PCBs during different phases of the PCB cleanup project. Phase I (June 5-8, 1990) and Phase II (January 14-18, 1991) were carried out prior to incineration. Phase III (February 4-26, 1991) was performed during compliance tests of the Ensco incinerator. Phase IV (April 15- 19, 1991) was conducted during continuous PCB incineration. Phase V (April 19-23, 1993) occurred after the completion of the cleanup and dismantlement of the incinerator.

Air samples were screened for ambient PCBs every 2 minutes using the mobile TAGA operated by the Environmental Monitoring and Reporting Branch. Over 3500 2-minute air samples were analyzed for the di-, tri-, tetra- and penta-chlorobiphenyl congeners during the cleanup process.

A total of 246 half-hour average concentrations were determined downwind of the Smithville PCB disposal site. Fifty half-hour averages were above the TAGA detection limit for total PCBs before and during PCB incineration. On two separate occasions, when the incinerator was on "hot standby", PCB levels (510 and 600 ng/m^3) were slightly above the MOEE standard of 450 ng/m^3. Over 99% of the PCB levels were below the MOEE standard. PCBs were only detected at close proximity of the PCB disposal site. From this study it was concluded that any PCBs measured originated from the site itself, and not the incineration unit.

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1.0 INTRODUCTION

As part of the Smithville PCB cleanup project, air monitoring was required during all phases of operation to ensure strict adherence to MOEE guidelines. This was the first time a Class 1 mobile PCB destruction facility was allowed to operate in Ontario. Brief description of Environmental Systems Company (Ensco) incinerator is shown in Appendix A. At the request of the West Central Region, the mobile TAGA unit of the Environmental Monitoring and Reporting Branch (EMRB) conducted a five-phase ambient PCB monitoring survey in Smithville, Ontario.

1.1 Survey Objective

The survey objective was to provide on-site ambient concentration measurements of selected PCBs in the vicinity of the Smithville PCB disposal site during different phases of operation. Phase I: background monitoring before the set-up of the mobile Ensco incinerator. Phase II: pre-operational monitoring after the set-up of the incinerator but prior to planned tests of PCB incineration. Phase III: compliance tests monitoring during the compliance tests of liquid and solid PCB waste incineration. Phase IV: operational monitoring during the PCB waste incineration operation. Phase V: post-operational monitoring after the completion of PCB waste incineration and the dismantlement of the Ensco incinerator.

The Smithville PCB disposal site, formerly Chemical Waste Management Limited, is situated at the south-east corner of Spring Creek Road and Thompson Avenue (approximately 3 km north-east of the Smithville town centre). Over 160,000 litres of PCB bearing liquids, as well as contaminated soil and other solids were stored at this site for the proposed on-site incineration. The former lagoon area was covered with a plastic membrane to prevent rainwater from adding to the water table and to prevent PCB vapours and contaminated dust from moving off site.

1.2 General Description of the Mobile Unit

The host vehicle for the Trace Atmospheric Gas Analyzer (TAGA) instrument is a ten-metre Orion coach specially designed as self-contained mobile laboratory for air monitoring. The layout of the mobile laboratory is illustrated in Figure 1.2.1. Equipment in the mobile includes two computer work stations, 17.5 kw generator, meteorological station with retractable tower, fume hood, refrigerator, and communications package. The computer workstations allow direct control of the instrument and data processing. The automatic start feature permits unattended generator power-up of the instrument prior to the monitoring day. A stable temperature is maintained inside the mobile by roof mounted air conditioners or wall mounted electric heaters. Its valuable contents are protected by a halon fire extinguishing system. The meteorological station monitors atmospheric

temperature at the roof height and wind speed and direction at a tower height of 10 m. The fume hood and the refrigerator are used for safe storage of chemical standards. The communication package includes: cellular phone for outside contact, fax machine for data and information transfer, and two-way radio for local communication among survey members in different vehicles.

1.3 TAGA PCB Technique

The TAGA 6000 unit, a mobile tandem mass spectrometer, is capable of rapidly identifying and quantifying a broad range of trace organic and inorganic pollutants. When monitoring for PCBs the ion source is coupled to an Automated Short Term Adsorber (ASTA), a device designed to preconcentrate ambient PCBs. The ASTA/TAGA technique provides ambient PCB measurements in 2-minute intervals, with a half-hour average the result of 15 consecutive 2-minute samples. The air is screened for selected PCBs (di-, tri-, tetra- and penta-chlorobiphenyl congeners). Detection limits are typically 5 to 50 ng/m^3 per congener group for a 2-minute sampling period. Total PCBs refer to the sum of the di-, tri-, tetra- and penta-chlorobiphenyl congeners. The Ministry standard for a half-hour average of total PCBs is 450 ng/m^3. Detailed descriptions of the TAGA PCB technique are included in Appendix B.

2.0 MOBILE TAGA SURVEY RESULTS AND DISCUSSION

2.1 Phase I: Background

During the period of June 5 to 8, 1990, the TAGA conducted a survey to establish the background levels of selected PCBs prior to Ensco setting up their mobile incinerator at the Smithville PCB disposal site. A day-to-day summary of the monitoring activities during this phase is provided below.

June 5

Sunny day with winds from the SW at 25 to 40 km/hr. Starting 13:59, TAGA calibrations were established on Spring Creek Road, east of Thompson Avenue. Background measurements were taken on London Road, north of the water tower. The TAGA detection limit for total PCBs was 97 ng/m^3. A half-hour average (Sample S01; Table 2.1.1) of PCBs was acquired at 17:18 downwind of the PCB disposal site on Spring Creek Road (Site A; Figure 2.1.1).

June 6

A partially cloudy day with winds from the SW at 25 to 35 km/hr. Upwind measurements were taken on London Road, 30 m east of Thompson Avenue. The TAGA detection limit for total PCBs was 86 ng/m^3. Four half-hour averages (S02-S05) were recorded on Spring Creek Road near the east end of the PCB disposal site (Site B). Another three half-hour averages (S06-S08) were taken on Spring Creek Road directly across from the vehicle access gate (Site C). Two more half-hour averages (S09-S10) were measured again at Site B.

June 7

A sunny day with winds from the N to NW at 15 to 25 km/hr. PCB calibrations were conducted on Spring Creek Road, just west of Thompson Avenue. The TAGA detection limit for total PCBs was 59 ng/m^3. Possible downwind monitoring east of the disposal site along Industrial Park Road was obstructed by tall trees located immediately east of the disposal site. The TAGA was situated on Spring Creek Road 100 m west of Industrial Park Road (Site D), the only accessible location for downwind monitoring. Six half-hour averages (S11-S16) were measured. Another half-hour average (S17) was taken 50 m west of Site D on Spring Creek Road (Site E). The winds shifted during the measurement of S17. The TAGA was relocated for two half-hour averages (S18, S19) on Industrial Park Road 100 m north of London Road (Site F).

June 8

Throughout the morning winds were from S to SSE, with a light rain. PCB calibrations were performed on Industrial Park Road, midway between Spring Creek Road and London Road. The TAGA detection limit for total PCBs was 34 ng/m^3. Four half-hour averages (S20-S23) were acquired on Spring Creek Road 75 m east of Thompson Avenue (Site G).

During the Phase I monitoring period, twenty-three half-hour averages (Table 2.1.1) of PCBs were acquired at 7 locations (Figure 2.1.1). PCBs were not present downwind of the site. All monitoring sites were within 300 m of the PCB disposal site.

2.2 Phase II: Pre-Operation

During the week of January 14, 1991, the TAGA conducted another survey downwind of the Smithville PCB disposal site. The monitoring results are summarized in Table 2.2.1. The Ensco incinerator was completely assembled but not yet operating. This phase is referred to as pre-operational. A day-to-day summary of the results is provided below.

January 14

At approximately 10:20 the TAGA 6000 arrived at the Smithville PCB disposal site. PCB calibrations were carried out on Thompson Avenue about 100 m north of London Road. The TAGA detection limit for total PCBs was 30 ng/m^3. In the afternoon three half-hour averages (S01-S03; Table 2.2.1) of PCBs were acquired on Spring Creek Road (Site A; Figure 2.2.1) opposite to the Ensco incinerator tent, approximately 25 m from the TAGA. Strong SW winds were recorded at speeds up to 55 km/hr. During the monitoring period, moist PCB-tainted soil was being moved closer to the Ensco facility. Solvent odours were present, thus the most probable source of airborne PCBs was the pile of moist soil. Selected PCBs were monitored and trace levels were detected. Penta-PCB was not detected in any of the air samples.

January 15

TAGA calibrations were established upwind of the PCB disposal site, on Thompson Avenue about 300 m south of Spring Creek Road starting at 08:30. The TAGA detection limit for total PCBs was 44 ng/m^3. At noon, The TAGA was located downwind at Site A where seven half-hour averages (S04-S10) were collected. Winds were light out of the WSW and mild solvent odours were apparent. As observed in the previous day, PCB-tainted soil was being excavated. The first half-hour average (S04) indicated PCB levels of 280 ng/m^3. (Note that this was the only time penta-PCB was detected in Phase II). Half-hour averages S05 and S06 showed PCB levels (sum of di-, tri- and tetra-PCBs) of 270 and 150 ng/m^3, respectively. During sample S07 (19 ng/m^3) only tri-PCB was detected. At approximately

14:00, winds became very calm, odours subsided and PCBs were not detected.

January 16

Conditions were raining and foggy, with limited visibility. PCB calibrations were conducted at 13:30 on Spring Creek Road about 50 m west of Thompson Avenue. The detection limit for total PCBs was 37 ng/m^3. At 16:15, the TAGA was moved downwind to Thompson Avenue (Site B). Four half-hour averages (S11-S14) were recorded. Odours were not present and PCBs were not detected. Soil excavation was not performed on this day.

January 17

Starting at 09:00, upwind measurements were acquired on Thompson Avenue about 300 m south of Spring Creek Road. The TAGA detection limit for total PCBs was 53 ng/m^3. Moderate winds were mainly from the W. Downwind measurements were acquired on Industrial Park Road (Site C). Four half-hour averages (S15-S18) were recorded in the absence of any odours and PCBs were not detected. The TAGA was moved to Spring Creek Road (Site D), to avoid wind barrier effects from the trees along Industrial Park Road. Four half-hour averages (S19-S22) were acquired in which PCBs were not detected. Similar to the previous monitoring day, soil excavation was not occurring.

January 18

PCB calibrations were performed on Thompson Avenue, 300 m south of Spring Creek Road. The detection limit for total PCBs was 57 ng/m^3. Strong winds were mainly from the WSW. Four half-hour averages (S23-S26) were recorded on Spring Creek Road (Site A) about 25 m from a pile of soil. These half-hour averages were below the TAGA detection limit for total PCBs. Occasionally very mild solvent odours were noted. In the first two half-hour averages tri- and tetra-PCBs were detected whereas in the last two only tri-PCB was detected.

The Phase II results indicated that under certain conditions (e.g. soil agitation and meteorological conditions) PCBs were present outside the perimeter of the fenced PCB site. Twenty-six half-hour averages (Table 2.2.1) were recorded during this survey, and PCB levels were measured over the detection limits six times. The TAGA detection limit for total PCBs during this survey averaged to 44 ng/m^3. The maximum half-hour average total PCB concentration, 280 ng/m^3, was recorded at Site A on January 15 under ideal monitoring conditions: light winds from the south-west.

2.3 Phase III: Compliance Tests

During the month of February 1991, the TAGA monitored selected PCBs in ambient

air during Ensco's compliance tests. These tests were conducted in order to monitor stack emissions for regulatory approval. TAGA monitoring was scheduled to be conducted concurrent with stack sampling. The compliance tests were performed in two parts: incineration of PCB soil and waste fuel, then incineration of shredded capacitors together with PCB liquid waste fuel. This survey commenced on February 4 and ended on February 26. Monitoring was conducted while the incinerator was on "hot standby" and during compliance tests. Throughout the survey period, information on Ensco's incineration status was provided by Proctor & Redfern Limited (P&R), a consulting firm which oversaw the PCB cleanup project.

Starting on February 7 attempts were made to burn PCB tainted soil (approximately 3 ppm PCBs). A number of mechanical problems, partly due to soil wetness, prevented continuous incineration. Stack sampling was not performed until February 12. Six compliance tests were required under two different feed conditions: three during incineration of PCB soil and liquid waste fuel and three during incineration of shredded capacitors mixed with PCB waste fuel. However, due to various mechanical problems with the incinerator and occasional difficulties with the stack testing instrumentation, tests were not completed until February 26. Stack sampling tests were considered successful on February 16, 19, 20 and 24-26.

2.3.1 Incinerator on Hot Standby

February 4

The TAGA arrived in Smithville at 10:15. Conditions were sunny and warm with SW winds at 20-45 km/hr. The incinerator was operating on hot standby. Two plumes from a short stack and a tall stack above the Ensco incinerator tent were visible. Upwind calibrations were performed on London Road 50 m east of Thompson Avenue. The TAGA detection limit for total PCBs was 60 ng/m^3.

At approximately 14:00, while the TAGA was about to commence downwind measurements, the incinerator was halted due to a defective gasket. Despite this, two half-hour averages (S01, S02; Table 2.3.1) for PCBs were recorded downwind on Young Street, about 1 km north-east of the incinerator (Site A; Figure 2.3.1). Odours were not present and PCBs were not detected. Starting at 16:07, three half-hour averages (S03-S05) of 430, 560 and 600 ng/m^3 were acquired on Spring Creek Road, 200 m east of Thompson Avenue (Site B). During monitoring, solvent odours were present. The most probable source was a pile of refuse and excavated soil, 30 m from the TAGA, on the east side of the Ensco tent.

February 5

Winds were SSW in the morning shifting to W in the afternoon. Conditions were overcast with fog. Again the incinerator was operating on hot standby. Emissions from the

Ensco incinerator stacks were visible. Upwind calibrations were performed on London Road just east of Thompson Avenue. The TAGA detection limit for total PCBs was 36 ng/m^3.

Starting at 12:05 plume tracking was performed downwind of the incinerator. Mild burning odours were noticeable on Spring Creek Road, 200 m east of Industrial Park Road (Site C), beside a MOEE monitoring station. Two half-hour averages (S06, S07) were recorded. PCBs were not detected above the detection limit. Three more half-hour averages (S08-S10) were acquired on Spring Creek Road, 200 m east of Thompson Avenue (Site D). Trace levels of PCBs were detected. Intermittent solvent odours were noted. Emissions from two Ensco stacks were continuous throughout the monitoring periods. The plumes were travelling over the TAGA, about 30 m above ground.

February 6

Conditions were cloudy with light winds from NNE in the morning shifting to NE by noon. A low level dense fog resulted in periodic reduced visibility. The Ensco incinerator was operating on hot standby. Continuous emissions from the tall stack were visible. Upwind calibrations were performed on Spring Creek Road 100 m west of Industrial Park Road. The TAGA detection limit for total PCBs was 26 ng/m^3.

Following upwind calibrations the TAGA moved downwind to the parking lot of John Calvin School (Site E) adjacent to a MOEE monitoring station. Three half-hour averages (S11-S13) were recorded at this site with the incinerator still on hot standby. PCBs were not detected above the detection limit. At 14:00, P&R informed the TAGA crew that PCB compliance tests were scheduled to commence in two hours. Due to wind shifts the TAGA was relocated to the west end of London Road, 40 m west of Thompson Avenue (Site F) where four half-hour averages (S14-S17) were acquired. Emissions from the Ensco stacks were continuous throughout the monitoring periods. The plumes were travelling over the TAGA. The half-hour average PCB concentrations did not exceed the detection limit.

According to information received from P&R, PCB compliance tests were scheduled for early morning of February 7. Thus, TAGA monitoring was halted for the day at 17:15.

February 7

Conditions were cloudy with moderate winds from the N. Continuous emissions from the tall stack were visible. Upwind calibrations were performed on Spring Creek Road 50 m west of Thompson Avenue. The TAGA detection limit for total PCBs was 33 ng/m^3.

Following upwind calibrations the TAGA moved downwind to a parking lot near Industrial Park Road, 50 m north of London Road (Site G), just south of a MOEE monitoring station. Ten half-hour averages (S18-S27) were recorded at this site. PCBs were not detected above the detection limit.

According to information received from P&R, incineration of PCB contaminated soil commenced at 06:30 and was terminated 1 hour later due to a minor mechanical failure. Incineration of PCB soil resumed at approximately 14:00 but once again was halted due to a similar failure. This resulted in an aborting of the compliance test. PCB incineration was rescheduled for the following morning. TAGA monitoring was halted for the day at 16:38.

February 8

Conditions were partly cloudy with SW winds at 10-30 km/hr. Upwind calibrations were performed on London Road, 40 m west of Thompson Avenue. The TAGA detection limit for total PCBs was 32 ng/m^3.

Following upwind calibrations the TAGA moved downwind on Spring Creek Road, 100 m east of Thompson Avenue (Site H). Continuous emissions from the tall stack were occasionally impinging on Spring Creek Road where the TAGA was located. Intermittent mild solvent odours were noticeable. Starting at 14:16, five half-hour averages (S28-S32) were recorded at Site H. During the first half-hour average (S28), di- but mainly tri- and tetra-PCBs were detected. Tri- and tetra-PCBs were detected at trace levels during S29. PCBs were not detected above the detection limit for S30-S32.

According to information received from P&R, incineration of PCB contaminated soil commenced at 06:00 and was terminated at approximately 09:00 due to a mechanical failure. TAGA monitoring was halted at 17:00.

February 9

Saturday, February 9 was partly cloudy with SW winds at 10-30 km/hr. Upwind calibrations were performed in the parking lot of Stanpac, 40 m west of Thompson Avenue and 100 m south of Spring Creek Road. The TAGA detection limit for total PCBs was 42 ng/m^3.

Following upwind calibrations the TAGA moved on Spring Creek Road, 150 m east of Thompson Avenue (Site B), downwind of a pile of soil and a pile of refuse. Continuous emissions from the tall stack were occasionally impinging on Spring Creek Road where the TAGA was located. Intermittent mild solvent odours were noticeable. Starting at 13:32, three half-hour averages (S33-S35) were recorded at this site. The total PCB concentrations were 290, 220 and 140 ng/m^3. Incineration of PCBs was not conducted during the monitoring period. The recorded PCB measurements, as those of February 4 and 5, most likely corresponded to fugitive emissions from the site.

February 10

Upwind calibrations were established on Spring Creek Road, 50 m west of Thompson Avenue. The TAGA detection limit for total PCBs was 46 ng/m^3. While proceeding to a

downwind site, P&R informed the TAGA crew that incineration of PCB contaminated soil was terminated at approximately 10:00 due to a major mechanical failure. TAGA monitoring was halted for the day.

February 11

The TAGA was on standby. Compliance tests were not conducted thus monitoring was not required.

As shown in Table 2.3.1, thirty-five half-hour averages of PCBs were acquired downwind of the PCB disposal site during February 4-9. PCBs were only detected on Spring Creek Road (Sites B, D and H), about 50 m from the north-east corner of the Ensco tent where intermittent mild solvent odours were occasionally present. Two half-hour averages (S04, S05) of 510 and 600 ng/m^3 were slightly above the Ministry standard of 450 ng/m^3 for total PCBs. Four half-hour averages (S03, S33-S35) were 380, 290, 220 and 140 ng/m^3. Four half-hour averages (S08-S10, S28) showed traces of PCBs i.e., levels were between the detection limit and the quantitation limit. Since the incinerator was on hot standby, it is reasonable to assume that the recorded PCB measurements corresponded to fugitive emissions from the PCB disposal site. Potential sources of PCBs included the soil, the PCB containment building and the water treatment building. It is noteworthy that the capacitor shredder was also in operation on February 4 when the highest PCB levels were recorded. A graphical representation of the data obtained prior to compliance tests is shown in Figure 2.3.2.

2.3.2 Compliance Test I: Incineration of PCB Soil and PCB Liquid Waste Fuel

February 12

At approximately 14:00, P&R requested simultaneous TAGA monitoring during stack sampling tests which had been scheduled to start at 16:00. The TAGA crew left Toronto at 14:30 and arrived in Smithville at 15:30.

After inspection of the TAGA performance, downwind monitoring commenced at 16:35 on Spring Creek Road, 100 m east of Thompson Avenue (Site H). Continuous emissions from the tall stack were occasionally impinging on Spring Creek Road where the TAGA was located. Odours were not present. According to information received from P&R, 3 ppm PCB contaminated soil was loaded for incineration at a rate of about 1800 kg/hr. In addition, 55 kg/hr of liquid fuel containing 40% PCBs was also introduced. Four half-hour averages (S36-S39) were recorded. Total PCB concentrations were below the detection limit. Only traces of di- and tri-PCBs were detected during the two-hour monitoring period.

Upwind calibrations were performed on Thompson Avenue, 75 m north of London Road. The TAGA detection limit for total PCBs was 50 ng/m^3.

According to information received from P&R at 18:05, stack sampling tests were postponed for the following morning.

February 13

Morning conditions were cloudy with winds out of the SW followed by afternoon snow and winds shifting to the SE. Upwind calibrations were performed on London Road, 100 m west of Industrial Park Road. The TAGA detection limit for total PCBs was 95 ng/m^3, about 2 to 3 times higher than those obtained the previous week. This was determined to be due to elevated background levels of penta-PCB from an unsubstantiated source.

Following upwind calibrations the TAGA moved downwind on Spring Creek Road, 150 m west of Thompson Avenue (Site I). Continuous emissions from the tall stack occasionally impinged on Spring Creek Road. Starting at 11:59, six half-hour averages (S40-S45) were recorded at this site. PCBs were not detected above the detection limit.

At 14:20, P&R informed the TAGA crew that stack sampling tests were delayed once again.

February 14

Conditions were overcast and foggy with calm winds from the N and with overnight accumulation of 2 cm snow. Starting at 08:48, upwind calibrations were performed on Spring Creek Road, 100 m west of Industrial Park Road. The TAGA detection limit for total PCBs was 29 ng/m^3. Snow flurries started at 10:00 and continued for the next 18 hours.

At 08:42, 3 ppm PCB contaminated soil was loaded for incineration. At 17:30 liquid fuel containing PCBs was added for incineration. At 19:18, stack sampling tests began and were terminated two hours later due to technical problems.

Nineteen half-hour averages, 14 prior to (S46-S59) and 5 during stack sampling tests (S60-S64), were acquired between 10:36 and 23:04 downwind of the incinerator. Due to continuous wind shifts, the TAGA repositioned downwind six different times. During most of the monitoring periods a wide plume from the incinerator's tall stack passed directly above the TAGA. Odours were not present. None of the PCB half-hour averages exceeded the detection limit.

February 16

Conditions were overcast with sunny breaks and strong winds from the W. Upwind calibrations were performed at 09:15 in the parking lot of Stanpac, 100 m south of Spring Creek Road. The TAGA detection limit for total PCBs was 17 ng/m^3.

Five half-hour averages (S65-S69) were acquired on Industrial Park Road 150 m

north of Spring Creek Road (Site O). Emissions from the incinerator occasionally reached the TAGA. Odours were not present and PCBs were not detected.

Three half-hour averages (S70-S72) were acquired on Spring Creek Road 100 m east of Thompson Avenue (Site B), on the east side of the Ensco tent about 30 m from a pile of soil. Very mild solvent odours were present. Occasional emissions from the stack passed over the TAGA. Traces of PCBs were detected. The TAGA moved 20 m west of site B (Site H) where four half-hour averages (S73-S76) were recorded. At site H, downwind of the stack but not downwind of the soil, no PCBs were detected by the TAGA. It is thus reasonable to assume that the traces of PCBs detected at site B were due to fugitive emissions from the site, not from the stack.

At approximately 18:45, 2000 kg/hr of contaminated soil was added to the incinerator together with liquid fuel containing PCBs. Four half-hour averages (S77-S80) were acquired during stack sampling tests. Although the plume occasionally reached the TAGA, no odours were noted nor were PCBs detected above the detection limit. TAGA monitoring was halted at 21:16.

February 17

Stack sampling was not scheduled for February 17, thus the TAGA was on standby.

February 18

Conditions were overcast with moderate winds from the ENE. At 14:50 the TAGA crew was notified by P&R that stack sampling tests were to commence within the hour. Downwind measurements were performed in the parking lot of John Calvin School (Site E) at 16:20. Five half-hour averages (S81-S85) were acquired at this site during which emissions from the incinerator drifted over the TAGA. Light rain started to fall at 17:55. Odours were not present and PCBs were not detected. It was later confirmed by P&R that stack sampling tests started at 16:15 and lasted for only ten minutes.

At 19:33, upwind calibrations were performed on the south side of Spring Creek Road 30 m east of Industrial Park Road. The TAGA detection limit for total PCBs was 31 ng/m^3.

P&R informed the TAGA crew at 21:40 that the stack sampling tests were rescheduled for the following morning.

February 19

Conditions were overcast with moderate winds from the SSW. At 09:23, upwind calibrations were performed on the north side of London Road 20 m east of Thompson Avenue. The TAGA detection limit for total PCBs was 27 ng/m^3.

The Ensco incinerator was on hot standby in the morning. Low level PCB contaminated soil (0.58%) was fed for incineration at 10:33. Starting at 12:45, 31% PCB waste fuel was also added with the soil at 1 kg/min. Stack sampling tests started at 13:49 and completed at 22:15. The incinerator was placed back on hot standby at 22:30.

Downwind measurements were performed on Spring Creek Road, 50 m east of Thompson Avenue (Site H) at 12:08. Six half-hour averages (S86-S91) were acquired. Emissions from the incinerator drifted over the TAGA and landed in an open field 100 m north of Spring Creek Road. Faint solvent odours were present. PCBs were detected at trace levels prior to and during incineration of PCB waste fuel, indicating that detected PCBs were due to fugitive emissions from the site. PCBs were also detected on February 4, 5, 8, and 16 at this monitoring site (near the Ensco tent along Spring Creek Road).

The TAGA then repositioned to the north side of Young Street, 60 m east of Industrial Park Road (Site P). Four half-hour averages (S92-S95) were acquired. Odours were not present and PCBs were not detected.

At 18:35, the TAGA was relocated on Spring Creek Road, 100 m east of Thompson Avenue (Site B) and one half-hour average (S96) was obtained. Trace PCBs were detected. Reconfirming that the site, not the stack, was the source of trace PCBs. TAGA monitoring was halted at 19:08.

February 20

Conditions were overcast with moderate winds from the W and sporadic flurries. Upwind calibrations were performed on London Road, 40 m west of Thompson Avenue. The TAGA detection limit for total PCBs was 26 ng/m^3.

The Ensco incinerator was on hot standby in the morning. Low level PCB contaminated soil (0.52%) was fed for incineration at 11:45. Starting at 13:40, PCB waste fuel was added with the soil at 1 kg/min. Stack sampling tests started at 14:15 and were completed by 22:20. Brief interruptions during stack sampling tests in the periods 16:00-17:00 and 18:00-19:30 were caused by feeding problems. The incinerator was placed on standby at 22:30.

Downwind measurements commenced at 15:56 on Spring Creek Road (Site D), approximately 75 m from the stack. The plume from the stack drifted near the TAGA, impinging in the open field to the north of Spring Creek Road. One half-hour average (S97) was acquired at this site. PCBs were not detected. At 16:28 the TAGA was moved 20 m west to Site B, 30 m from a pile of soil. The plume occasional impinged on the roof of the TAGA. Three half-hour average concentrations of PCBs (S98-S100) were measured producing values of 150, 180 and 210 ng/m^3. At 17:05, the TAGA moved westwards 20 m of Site B (Site H). Six half-hour averages (S101-S106) were acquired. Only traces of tri-PCB were detected. TAGA monitoring was halted at 21:39.

Compliance Test I involved incineration of PCB waste soil and PCB waste fuel. Stack sampling tests were performed on February 16, 19 and 20. During stack sampling 2000 kg/hr of approximately 0.58% PCB soil mixed with 1 kg/min of not more than 40% PCB liquid fuel were incinerated (roughly 1.6% total PCBs). Twenty-four half-hour averages (Shaded area; Table 2.3.1) were measured at five different sites downwind of the incinerator, concurrently with stack sampling. Figure 2.3.3 shows the TAGA results obtained simultaneously with stack sampling during compliance test I. While sampling on Spring Creek Road (Site B or H), the plume from Ensco's stack drifted above the TAGA, occasionally impinging on it. Most of the time, however, the plume landed in a field to the north of Spring Creek Road. PCB levels never exceeded the Ministry standard of 450 ng/m^3 during Compliance Test I. The highest PCB levels (150, 180 and 210 ng/m^3) were recorded on February 20 (S98-S100) at site B. Note that the half-hour average S98 was measured while PCB soil feed had been halted. This result, along with observations made during the period of hot standby, suggests that the source of the detected PCBs was the PCB disposal site, not the emissions from Ensco's stack. A total of forty-seven half-hour averages were also recorded during February 12 to 20 when low level PCB soil (3 ppm PCBs) was incinerated but stack sampling tests were either not performed or not completed satisfactorily. Trace PCBs (below the TAGA total quantitation limit) were detected on Spring Creek Road at Sites B and H.

2.3.3 Compliance Test II: Incineration of Shredded Capacitors and PCB Liquid Waste Fuel

February 21

Ensco was preparing for the second phase of incineration involving liquid and metal PCB waste.. The TAGA was on standby.

February 22

The TAGA crew, on standby in Toronto was informed at 15:45 that stack sampling tests had just begun. Two crew members immediately left for Smithville. Delayed due to heavy traffic, they arrived in Smithville at 18:45.

The Ensco incinerator was on hot standby that morning. Starting at 10:25, 5-gallon pails containing shredded capacitors were fed every 2 to 3 minutes to the incinerator, totalling 2800 kg. Stack sampling tests started at 15:45 and were completed at 22:10. The incinerator was placed on standby at 22:10.

Downwind measurements commenced at 19:43 on Industrial Park Road (Site M), approximately 250 m from the stack. The plume from the stack drifted above the TAGA, impinging in the field east of Industrial Park Road. Six half-hour averages (S107-S112) were acquired. The first five were recorded concurrently with stack tests during incineration of shredded capacitors. Trace levels, mainly tri-PCB and to a lesser extent di-PCB, were detected. The last half-hour average was recorded after the PCB incineration was

completed during which PCBs were not detected.

Upwind calibrations were performed at 23:24 in the west end of the Stanpac parking lot, 100 m west of Thompson Avenue. The TAGA detection limit for total PCBs was 27 ng/m^3.

February 23

According to information received from P&R in the morning, stack tests were scheduled for 12:00. While preparing for upwind TAGA calibrations, P&R notified the TAGA crew at 12:24 that tests were cancelled for the day. The Ensco incinerator was placed on hot standby all day.

February 24

Winds were from the SW in the morning, gradually shifting to NE by the afternoon. Calibrations for PCBs were performed at 10:00 upwind on London Road, 30 m east of Thompson Avenue. The TAGA detection limit for total PCBs was 52 ng/m^3.

The Ensco incinerator was on hot standby in the morning. Starting at 12:50, 5-gallon pails containing shredded capacitors were fed every 2 to 3 minutes for incineration, totalling 1500 kg. Stack sampling tests started at 14:50 and were completed at 19:45. The incinerator was placed on standby at 22:30.

The first half-hour average (S113) was measured on Spring Creek Road (Site D), downwind of a pile of soil, where mild solvent odours were occasionally noted. Visible plumes from the stack drifted high above the TAGA. The source of the detected PCBs was believed to be the pile of soil and not the Ensco stack.

Due to continuous wind shift, the TAGA relocated four more times between 14:07 and 20:30. Nine half-hour averages were recorded: three (S114-S116) on London Road (Site Q), two (S117, S118) on Thompson Avenue (Site R), one (S119) in the back laneway of TJMS machine shop (Site S), and three (S120-S122) on the north side driveway of the grain storage facility (Site T). TAGA monitoring was conducted concurrently with the entire stack sampling test. During this monitoring period the plume was 50 to 100 m above ground therefore the point of impingement could not be determined. Trace PCBs, mainly di- and tri-PCBs, were detected at Site T.

February 25

The ground was covered with approximately 7 cm of snow. Winds were predominantly NE at 10-20 km/hr. Upwind calibrations were performed at 10:34 on Spring Creek Road, 50 m east of Thompson Avenue. The TAGA detection limit for total PCBs was 28 ng/m^3.

The Ensco incinerator was on hot standby in the morning. Starting at 11:03, 5-gallon pails containing shredded capacitors were fed once every 2 to 3 minutes for incineration, A totalling of 1900 kg. Stack sampling tests started at 13:00 and were completed at 18:28. The incinerator was placed on standby at 22:30.

Downwind measurements commenced at 12:53 at the John Calvin School off County Road No. 14 (Site E), approximately 3/4 km from the stack. Two half-hour averages (S123, S124) were recorded. The TAGA moved to the south driveway of the grain storage facility on Thompson Avenue (Site U). The plume from the stack impinged on the storage facility, occasionally landing on the TAGA. Four half-hour averages (S125-S128) were acquired. Three more half-hour averages (S129-S131) were taken at the north-west corner of the grain storage facility (Site V). The TAGA monitoring was conducted concurrent with the stack sampling test. PCBs were not detected.

February 26

The ground was covered with approximately 10 cm of snow. Conditions were overcast with light winds predominantly from the N. Upwind calibrations were performed at 10:34 on the south side of Spring Creek Road, 10 m east of Thompson Avenue. The TAGA detection limit for total PCBs was 28 ng/m^3.

The Ensco incinerator was on hot standby in the morning. Starting at 11:20, 5-gallon pails containing shredded capacitors were fed every 2 to 3 minutes for incineration. Stack sampling tests started at 13:15 and completed at 19:23.

Downwind measurements commenced at 12:25. Due to wind shifts, only one half-hour average (S132) was recorded in the parking lot off Industrial Park Road, 50 m north of London Road (Site G). Another half-hour average (S133) was taken on the east side of Industrial Park Road, 100 m south of Spring Creek Road (Site M). Eleven more half-hour averages (S134-S144) were acquired at Site N, 70 m north of Site M on Industrial Park Road. The plume from the incinerator frequently drifted above the TAGA. The TAGA monitoring was conducted concurrently with the stack sampling test. PCBs were not detected.

According to information received from P&R at 19:55, the last part of the compliance tests was completed.

Compliance Test II involving incineration of metals and PCB liquids started on February 22, however, stack sampling tests were not successful. On February 24, shredded capacitors were fed to the primary combustor at 230 kg/hour and PCB liquid waste fuel to the secondary combustor at 2.3 kg/min. On February 25 and 26 the rate of PCB liquid fuel was increased to 7.7 lbs/min. During these three days, twenty six half-hour averages (Shaded area; Table 2.3.1) were acquired at nine different downwind locations (Sites E, M, N, U, V, Q, R, S, T; Figure 2.3.1) concurrent with all stack sampling tests. PCBs were not detected above the TAGA's

detection limit (Figure 2.3.3). Eleven half-hour averages were also recorded during February 22 to 26 with the incinerator on hot standby. Trace PCBs were detected only once on February 24 (S113; Table 2.3.1) on Spring Creek Road at site D.

During the Phase III survey, a total of 144 half-hour averages (Table 2.3.1) for PCBs were acquired by the TAGA at 22 different sampling locations (Figure 2.3.1) 30 to 1100 m from the Smithville PCB disposal site. Fifty were recorded concurrently with stack sampling tests. The results are illustrated in Figure 2.3.4. PCBs were not detected above the average TAGA detection limit of 38 ng/m^3 at distances exceeding 75 m from the PCB site. On two occasions PCB levels exceeded the Ministry guideline of 450 ng/m^3, when the incinerator was on hot standby. On seven occasions PCB levels were in the range 140 to 380 ng/m^3, and during sixteen instances levels were between the detection limit and the quantitation limit. PCBs were measured above the quantitation limit (approximately 125 ng/m^3) only on Spring Creek Road at distances not exceeding 50 m from the PCB site, at times when mild solvent odours were recognizable. Throughout this survey the plume from Ensco's stack was always visible. Several times while monitoring concurrent with compliance tests, the plume drifted over the TAGA, and occasionally was impinged on it. During such episodes neither odours nor PCBs were detected. It is believed that the PCBs detected during this survey, both when the incinerator was on hot standby or in operating mode, were due to fugitive emissions from the PCB site, <u>not</u> from the stack of the Ensco incinerator.

2.4 Phase IV: Operation

During April 15 to 19, 1991, the TAGA conducted a survey to monitor selected PCBs in ambient air during incineration of soil contaminated with PCBs. This survey was necessary in order to confirm the findings observed during Ensco's compliance tests which were conducted in February 1991.

TAGA monitoring results obtained at several locations (Figure 2.4.1), at various distances from the Smithville PCB disposal site are summarized in Table 2.4.1. The half-hour average PCB concentrations recorded in this survey are also shown graphically in Figure 2.4.2. A day-to-day summary of the monitoring activities is provided below.

<u>April 15</u>

The TAGA arrived in Smithville at 10:10. Conditions were E winds and rain, stopping by noon, followed by strong E winds gusting to over 30 km/hr. At 10:58, upwind calibrations commenced on Spring Creek Road, 100 m west of Industrial Park Road. The TAGA detection limit for total PCBs was 38 ng/m^3.

At 13:41, four half-hour averages (S01-S04; Table 2.4.1) for PCBs were recorded downwind on Spring Creek Road, 30 m east of Thompson Avenue (Site A; Figure 2.4.1).

Another half-hour average (S05) was acquired at 16:27 on Spring Creek Road, 150 m east of Thompson Avenue (Site B). Mild solvent odours were present at both sites. Winds were very strong. The plume from the stack drifted over the TAGA and in the field to the north of Spring Creek Road. PCBs were detected even when the plume was not in line with the TAGA. This indicated that the most probable source was due to fugitive emissions from the PCB disposal site (soil, PCB containment building, Thompson Environmental quonset hut, shredder). The highest half-hour average concentration was 230 ng/m^3. Note that PCBs were also detected at these sites during the pre-operational survey in January 1991 and during the compliance tests in February 1991 .

According to information received from P&R, 26000 kg of low level PCB soil (less than 0.58% PCBs) were incinerated between 07:00 and 19:00 at a rate of 3800 kg/hour.

April 16

Conditions were warm and sunny with moderate winds from the SW. Upwind measurements were acquired on Thompson Avenue, 150 m north of London Road. The detection limit for total PCBs was 23 ng/m^3.

At 10:51 the TAGA was moved downwind on Spring Creek Road, 150 m west of Industrial Park Road (Site C). Six half-hour averages (S06-S11) were recorded as the plume passed over and occasionally impinged on the TAGA. PCB measurements ranged from 130 to 300 ng/m^3. As the wind shifted from WSW to W, the TAGA was relocated to Spring Creek Road 15 m west of Industrial Park Road (Site D) where two half-hour averages of PCBs, S12 (96 ng/m^3) and S13 (93 ng/m^3), were recorded. Mild solvent odours were present during monitoring. As observed previously, the PCB source was the site, not the stack.

Between 07:00 and 16:00, 22000 kg of low level PCB soil (less than 0.58 % PCBs) were incinerated at a rate of 3800 kg/hr.

April 17

Starting at 09:00, upwind calibrations were performed on Spring Creek Road 30 m west of Thompson Avenue. The detection limit for total PCBs was 34 ng/m^3.

Downwind monitoring commenced at 10:56 at the north-west corner of Industrial Park Road and London Road (Site E). PCBs were not detected in the five acquired half-hour averages (S14-S18). The TAGA was relocated on Spring Creek Road 150 m west of Industrial Park Road (Site C) where three half-hour averages were recorded (S19-S21). Mild solvent odours were present with PCB concentrations ranging from "detected" to 220 ng/m^3. The TAGA was relocated once more to Industrial Park Road 50 m south of Spring Creek Road (Site F) where two half-hour averages were acquired (S22-S23). Trace di- and tri-PCBs were detected during the first half-hour average. During the second half-hour

average, winds shifted from WNW to N hence PCBs were not detected.

Between 07:00 and 16:00, 24000 kg of contaminated soil containing not more than 0.58 % PCBs were incinerated. At 15:06 PCB soil feeding was stopped and resumed at 19:23.

April 18

The Ensco incinerator was down for maintenance. No incineration of any PCB material was performed. The TAGA was on standby.

April 19

Conditions were partly cloudy with light winds from the NE. Starting at 08:41, upwind calibrations were performed on Spring Creek Road 100 m west of Industrial Park Road. The detection limit for total PCBs was 24 ng/m^3.

Two half-hour averages (S24-S25) were measured in the driveway of the grain storage building, 100 m west of Thompson Avenue about half way between London Road and Spring Creek Road (Site G). The plume was drifting high above the TAGA. Neither odours nor PCBs were detected. Another three half-hour averages (S26-S28) were acquired on Thompson Avenue about 75 m north of London Road (Site H). Trace PCBs were detected.

At 06:30, Ensco's incinerator temperatures were almost at incinerating levels with the primary kiln was at 860 °C and the secondary combustion chamber at 1100 °C. At 08:33 soil feed resumed with 15000 kg of soil containing less than 0.58% PCBs incinerated by 13:00. The feed stopped at 13:00 due to mechanical problems.

During the Phase IV survey, a total of 28 half-hour average concentrations (Table 2.4.1 and Figure 2.4.2) of PCBs were acquired by the TAGA at 8 different sampling locations (Figure 2.4.1) 50 to 500 m from the Smithville PCB disposal site. PCBs were detected above the quantitation limit only on Spring Creek Road at distances not exceeding 150 m from the PCB site, during periods when mild solvent odours were recognizable. PCB levels never approached the Ministry's standard of 450 ng/m^3 which is based on a half-hour average concentration of total PCBs. The highest half-hour average PCB level recorded was 300 ng/m^3 (S08). Throughout the Phase IV survey the plume from Ensco's stack was always visible. While monitoring on Spring Creek Road, the plume drifted over the TAGA and occasionally impinged on it. However, PCBs were not detected during such episodes. It is believed that the PCBs detected were due to fugitive emissions from the PCB site, not from the stack of the Ensco incinerator. These findings are in agreement with those obtained in February 1991, during the compliance tests.

2.5 Phase V: Post-Operation

During April 19 to 23, 1993, the TAGA conducted a survey to provide post-operational ambient air data of selected volatile PCBs in the vicinity of the Smithville PCB disposal site. This was the last phase of the five-phase survey. The planned PCB incineration operation was completed on December 17, 1992. The incineration unit was dismantled in mid-January 1993.

During this survey the entire field of the Smithville PCB disposal site was covered by a layer of dark incinerated soil (ash) to a minimum depth of 25 cm. Two piles of grey incinerated soil (ash) were deposited near the south fence of the site.

The air was screened for selected PCBs. Detection limits ranged between 5.9 and 52 ng/m^3 per congener group for a 2-minute sampling period. The TAGA monitoring results obtained at different locations (Figure 2.5.1) in the vicinity of the Smithville PCB disposal site are summarized in Table 2.5.1. A day-to-day summary of the monitoring activities is provided below.

April 19

The TAGA arrived in Smithville at 14:00. Winds were from the NE at 30 to 45 km/hr. One half-hour average (S01; Table 2.5.1) was recorded downwind at 15:16 on Thompson Avenue, 30 m south of London Road (Site A; Figure 2.5.1). Another half-hour average (S02) was acquired upwind at 16:07 on Spring Creek Road, 75 m east of Thompson Avenue (Site B). The TAGA detection limit for total PCBs was 105 ng/m^3.

April 20

Conditions were rain in the morning with winds from the SW at 30 to 55 km/hr. An upwind half-hour average (S03) was measured at 10:25 on Industrial Park Road, 150 m from Spring Creek Road (Site C). The rain stopped at the end of this monitoring period. The TAGA detection limit for total PCBs was 58 ng/m^3. Seven half-hour averages (S04-S10) were recorded downwind between 11:35 and 16:42 beside the fence of the PCB site on Spring Creek Road, 100 m east of Thompson Avenue (Site D).

April 21

Conditions were cool, 0 °C, with winds from the NNW at 10 to 30 km/hr. A half-hour average (S11) was taken upwind at 08:44 on Spring Creek Road, 75 m west of Thompson Avenue (Site E). The TAGA detection limit for total PCBs was 51 ng/m^3. Starting at 10:56, five half-hour averages (S12-S16) were measured downwind on Industrial Park Road, 150 m north of London Road (Site F). Another two half-hour averages (S17-S18) were acquired downwind between 14:21 and 15:52 on Industrial Park Road, 30 m north of London Road (Site G).

April 22

Conditions were cool in the morning with winds from the N at 20 to 35 km/hr. An upwind half-hour average (S19) was recorded at 09:26 on Site B. The TAGA detection limit for total PCBs was 71 ng/m^3. Two half-hour averages (S20-S21) were measured downwind between 11:00 and 12:20 on Industrial Park Road, 250 m south of Spring Creek Road (Site H). Four half-hour averages (S22-S25) were taken downwind on London Road, 75 m east of Thompson Avenue (Site I) starting at 12:33. Another two half-hour averages (S26-S27) were acquired downwind between 15:30 and 16:40 in the parking lot south of the PCB site, 50 m east of Thompson Avenue (Site J).

April 23

Winds were from the NNW at 15 to 45 km/hr. A half-hour average (S28) was taken upwind at 09:35 on Spring Creek Road, 150 m west of Thompson Avenue (Site K). The TAGA detection limit for total PCBs was 73 ng/m^3. Two half-hour averages (S29-S30) were acquired downwind on Site C between 10:31 and 11:40.

During the Phase V survey, a total of 30 half-hour averages (Table 2.5.1) of PCBs were acquired by the TAGA at 11 different sampling locations (Figure 2.5.1) in the vicinity of the Smithville PCB disposal site. Five half-hour averages were measured at upwind locations and were considered as background levels. Twenty-five half-hour averages were recorded at 8 downwind locations. Odours were not detected either upwind or downwind. There was no distinguishable difference between upwind and downwind measurements. All half-hour averages were measured below the detection limits, well below the Ministry standard of 450 ng/m^3 for total PCBs. PCBs were not detected by the TAGA during this monitoring period.

3.0 SUMMARY

The TAGA 6000 utilized a specialized monitoring technique for rapid screening of ambient air for volatile PCBs at a PCB disposal site in Smithville. The air was screened for selected PCBs (di-, tri-, tetra- and penta-chlorobiphenyl congeners). Detection limits ranged between 3.9 and 55 ng/m^3 per congener group. Total PCBs referred to the sum of these four PCB congeners. The Ministry standard for an half-hour average of total PCBs is 450 ng/m^3. Ensco was employed for on-site incineration of PCB solid and liquid wastes. This was the first time that a Class 1 mobile PCB destruction facility operated in Ontario. TAGA monitoring was conducted on-site in five phases.

Phase I: Background levels of PCBs were established in June 5 to 8, 1990, prior to Ensco setting up of the mobile incinerator. PCB levels were below the TAGA's detection limits and far below the MOEE standard.

Phase II: PCB levels were determined in January 14 to 18, 1991, when the Ensco incinerator was assembled on-site but not yet operating. PCBs were detected only under certain conditions (e.g. agitation of contaminated soil). The maximum half-hour average total PCB concentration recorded outside the perimeter of the fenced PCB disposal site was 280 ng/m^3, approximately 2/3 of the MOEE standard.

Phase III: Monitoring of PCBs was conducted in February 4 to 26, 1991, concurrent with Ensco's stack sampling compliance tests. Thirty-five half-hour averages of PCBs were measured while the incinerator was on hot standby. On two occasions PCB levels (510 and 600 ng/m^3) were slightly above the MOEE standard. Seventy-one half-hour averages of PCBs were recorded during incineration of PCB waste soil and PCB waste fuel. The highest half-hour average PCB levels (150, 180 and 210 ng/m^3) were less than 1/2 the MOEE standard. Thirty-eight half-hour averages of PCBs were measured during the incineration of metals and PCB liquids. PCBs were detected only once at trace levels. One hundred and forty-four half-hour averages of PCBs were recorded during Phase III; fifty concurrent with stack sampling. Only twice did PCBs exceeded the Ministry standard of 450 ng/m^3, when the incinerator was on hot standby. Seven times PCB levels were in the range 140 to 380 ng/m^3. Sixteen times PCBs were detected at trace levels. It is believed that the PCBs detected during this phase were due to fugitive emissions from the PCB disposal site, <u>not</u> from the stack of the Ensco incinerator.

Phase IV: PCBs were monitored in April 15 to 19, 1991, during continuous incineration of soil contaminated with PCBs. Twenty-eight half-hour averages of PCBs were acquired. The highest recorded level was 300 ng/m^3. As in Phase III detected PCBs were due to fugitive emissions from the contaminated soil at the PCB disposal site.

Phase V: Levels of PCBs were determined in April 19 to 23, 1993, after the removal of the Ensco incinerator from the PCB disposal site. The site was covered with incinerated soil (ash). All half-hour averages were below the TAGA's detection limit and far below the MOEE standard of 450 ng/m^3 for total PCBs.

Overall, PCBs were detected fifty times outside the PCB disposal site. Two times PCB levels were slightly above the MOEE standard. Over 99% of the half-hour average concentrations measured by the TAGA were below the MOEE standard. Whenever PCBs were detected, the TAGA was measuring at close proximity to the PCB disposal site. It is believed they originated from fugitive emissions from the PCB contaminated soil and refuse on site. The TAGA results indicated that PCBs were not present in the emissions from Ensco's incinerator stack.

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5.0 APPENDICES

5.1 Appendix A: Ensco Incinerator

A schematic diagram of the incinerator is shown in Figure 5.1.1. The incinerator is used for the destruction of toxic organic compounds through two separate stages of burning; exposure to temperatures of 790 to 980 °C in a rotary kiln, and then 1260 to 1400 °C in a secondary combustion chamber. The intense heat from the secondary chamber is recovered by a boiler which generates steam to run air pollution control devices. Each process is monitored and is designed to automatically shut it down if operating parameters are exceeded. Destruction of PCB contaminated soil and liquid wastes yields water, carbon dioxide and non-hazardous treated soil, which is further analyzed to ensure it is free of any toxics. If any are found, it can be recycled through the incinerator. TAGA monitoring was conducted during incineration to ensure compliance of the strict U.S. and Ontario's "Mobile PCB Destruction" requirement of 99.9999% destruction of PCBs in the waste.

5.2 Appendix B: TAGA PCB Technique

5.2.1 ASTA Sampling System

For most chemical classes, the TAGA is extraordinarily sensitive for determining trace levels of organic contaminants. The absolute sensitivity for PCBs however is insufficient for real time detection relative to the low standard set by the Ministry for PCBs (450 ng/m^3 for a half-hour sampling period). Thus a simple sampling device is used to concentrate the volatile PCBs for immediate analysis by the mobile TAGA unit. This device, known as the automated short term adsorber (ASTA), was described in detail in a paper presented by Ng and De Brou (Proceedings of the Sixth Technical Seminar on Chemical Spills, Calgary, Alberta, June 5-6, 1989). The ASTA, shown in Figure 5.2.1, consists of two OV-17 coated nichrome probes which can be rotated to place them alternatively in the ambient air stream or in the benzene/zero air stream. Species adsorbed to the probe are thermally desorbed into the TAGA's ionization chamber. The benzene serves as a chemical ionization reagent producing molecular PCB ions which are mass-analyzed by the TAGA. The time to complete one full cycle, or analysis, is 2 minutes and 8 seconds. A half-hour concentration of PCBs is determined by averaging 15 consecutive 2-minute adsorption/desorption cycles.

5.2.2 TAGA 6000 MS/MS Analyzer

A schematic diagram of the TAGA 6000 is shown in Figure 5.2.2. The basic operation is governed by the principles of APCI (atmospheric pressure chemical ionization) tandem mass spectrometry. Parent ions, formed in the APCI region, pass through an orifice into the vacuum chamber where they are separated by the first quadrupole (Q1) and fragmented via collision with argon gas in the second quadrupole Q2 (RF only). The resultant fragments, or daughter ions, are analyzed by the third quadrupole (Q3).

The ion chemistry of volatile PCBs under APCI conditions is relatively simple: PCB molecules (M) undergo charge transfer reactions with benzene ions to yield molecular parent ions (M^+). Under collisionally activated dissociation (CAD) conditions, daughter ions at $(M-35)^+$, $(M-36)^+$ and $(M-70)^+$ (i.e. loss of Cl, HCl or Cl_2) are observed. Figure 5.2.3 shows the CAD spectra of di- and tri-PCBs.

5.2.3 PCB Identification and Confirmation

In general, compound identification is achieved by comparing daughter ion spectra of real samples to standard TAGA CAD library spectra. The criteria for PCB identification are based on the chlorine isotopes and the characteristics of the desorption curves. By monitoring the ratios between the parent/daughter (P/D) ion pairs of each isomer group, it can be determined if the parent ions have the correct number of chlorine atoms.

Furthermore, times of desorption peaks, integrated areas, net PCB concentrations and signal to noise ratio for each isomer are determined. Typical desorption profiles for PCBs are shown in Figure 5.2.4.

The current computer programme allows for the simultaneous measurements of 4 PCB isomer groups (8 P/D ion pairs). Di- to penta-PCBs are the most common isomers found in industrial applications. Also, PCBs with higher degrees of chlorination possess lower vapour pressures, consequently they are less likely to be detected by the ASTA/TAGA technique. Confirmation of PCB presence is based on the following criteria:

i. P/D isotope pair ratios - within ±10% of the theoretical values;
ii. P/D isotope pair concentrations - within 20% for each isotope pair;
iii. Desorption peaks - synchronous for each isotope pair; and
iv. Signal to noise ratios - greater than three for each desorption curve.

5.2.4 PCB Quantification

PCB aqueous standards are introduced upstream of the adsorbing probe via a heated nebulizer set at 300 °C. A schematic diagram of the nebulizer is shown in Figure 5.2.5. The configuration of the nebulizer ensures uniform sample atomization of controlled amounts of PCBs into the TAGA. The calibrant is injected into the nebulizer's capillary tube with a 1 ml syringe mounted on an infusion pump. The flow rates of PCBs are controlled by the speed of the pump. Vapourized PCBs from the standard are mixed with the ambient airflow, trapped by the adsorption probe for subsequent desorption and analysis. Flow rates 0 to 16 μl/min allowed a PCB concentration range of 0 to 400 ng/m^3 per isomer group to be generated in the APCI source.

Six-point calibrations of PCBs are performed by simultaneously recording the responses of two parent/daughter (P/D) ions for four PCB isomers. Each PCB calibration level is repeated at least three times. The M+ and M+2 parent/daughter ion pairs are measured. Figure 5.2.6 shows examples of calibration plots for two congeners of the di- and tri-PCB isomer groups, both for the ^{35}Cl and ^{37}Cl isotopes. The response factors of the TAGA to a PCB isomer group is determined from the slope of the calibration plots. The standard deviations of the background, or upwind measurements, are used to determine the analytical detection limits.

During each survey day calibrations are performed at upwind locations to determine the response factors and the detection limits for each PCB isomer group. Also downwind ambient air samples are spiked periodically with an deuterated PCB internal standard (d_6 tetra-PCB, mass=296) to ensure that daily response factors are within their set limits. Typical detection limits for the di- to penta-PCBs generally range from 5 to 50 ng/m^3 per isomer group.

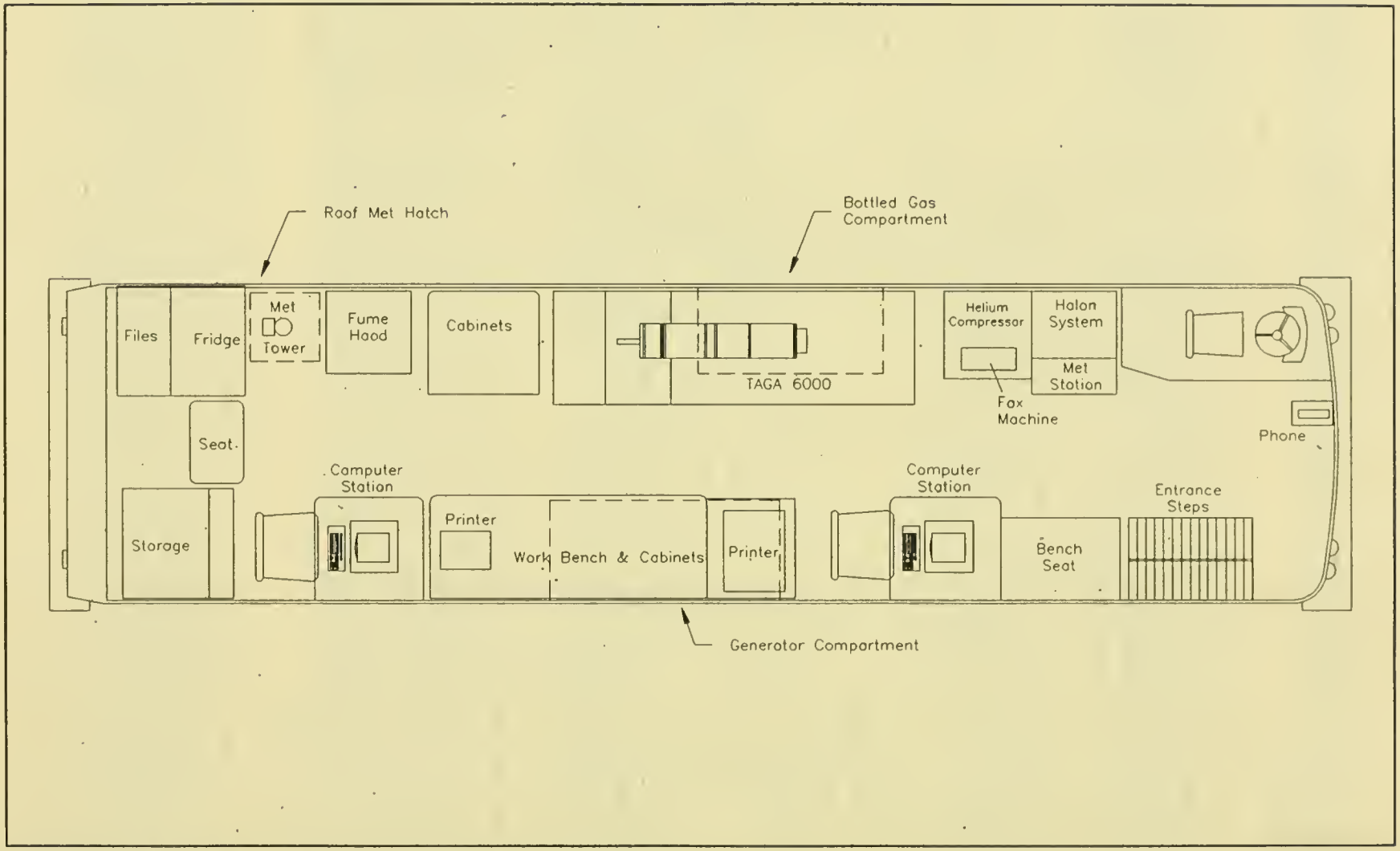


Figure 1.2.1: TAGA 6000 Mobile Laboratory Floor Plan.

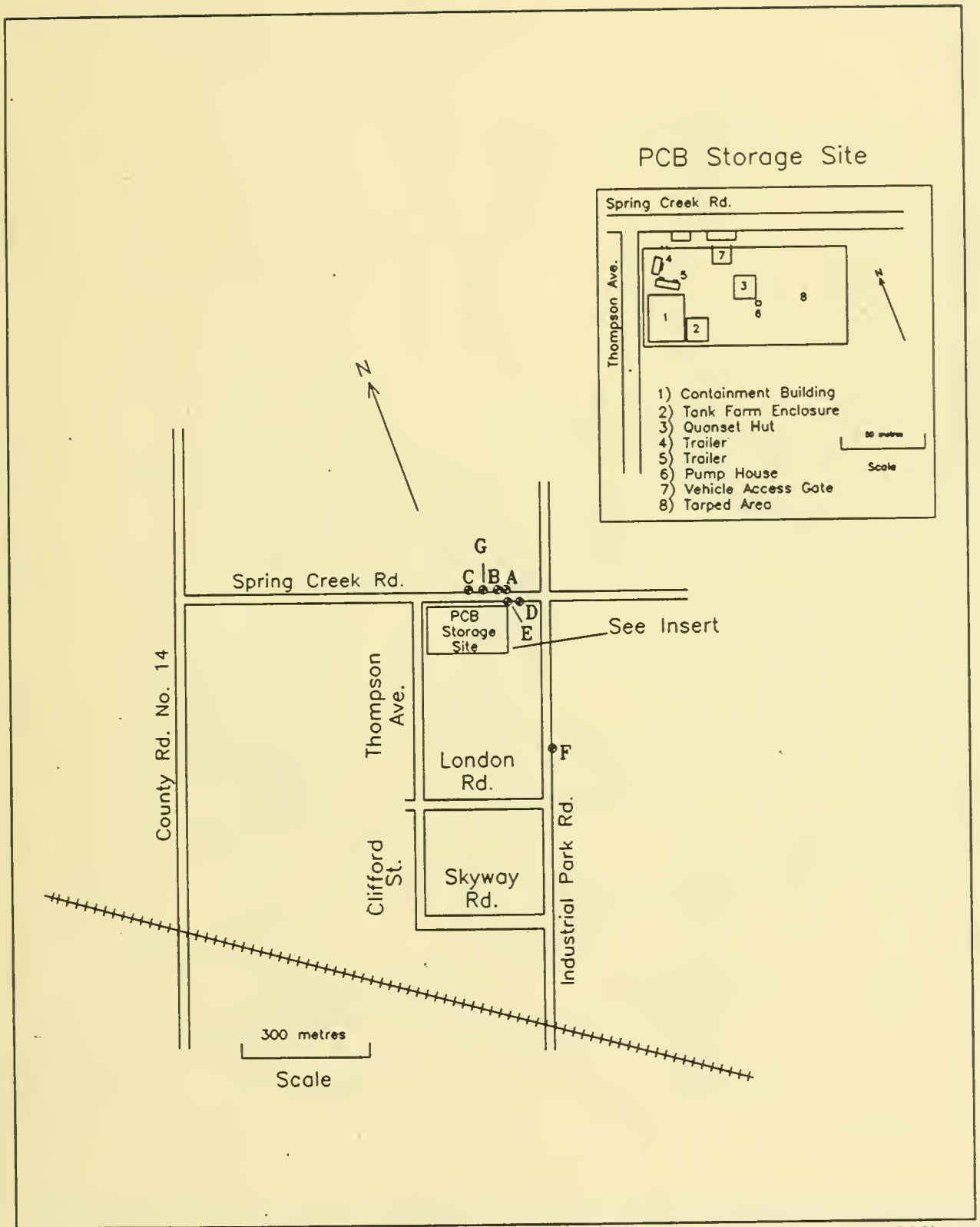


Figure 2.1.1: Monitoring Sites for PCBs During Phase I Survey, Smithville (June 1990).

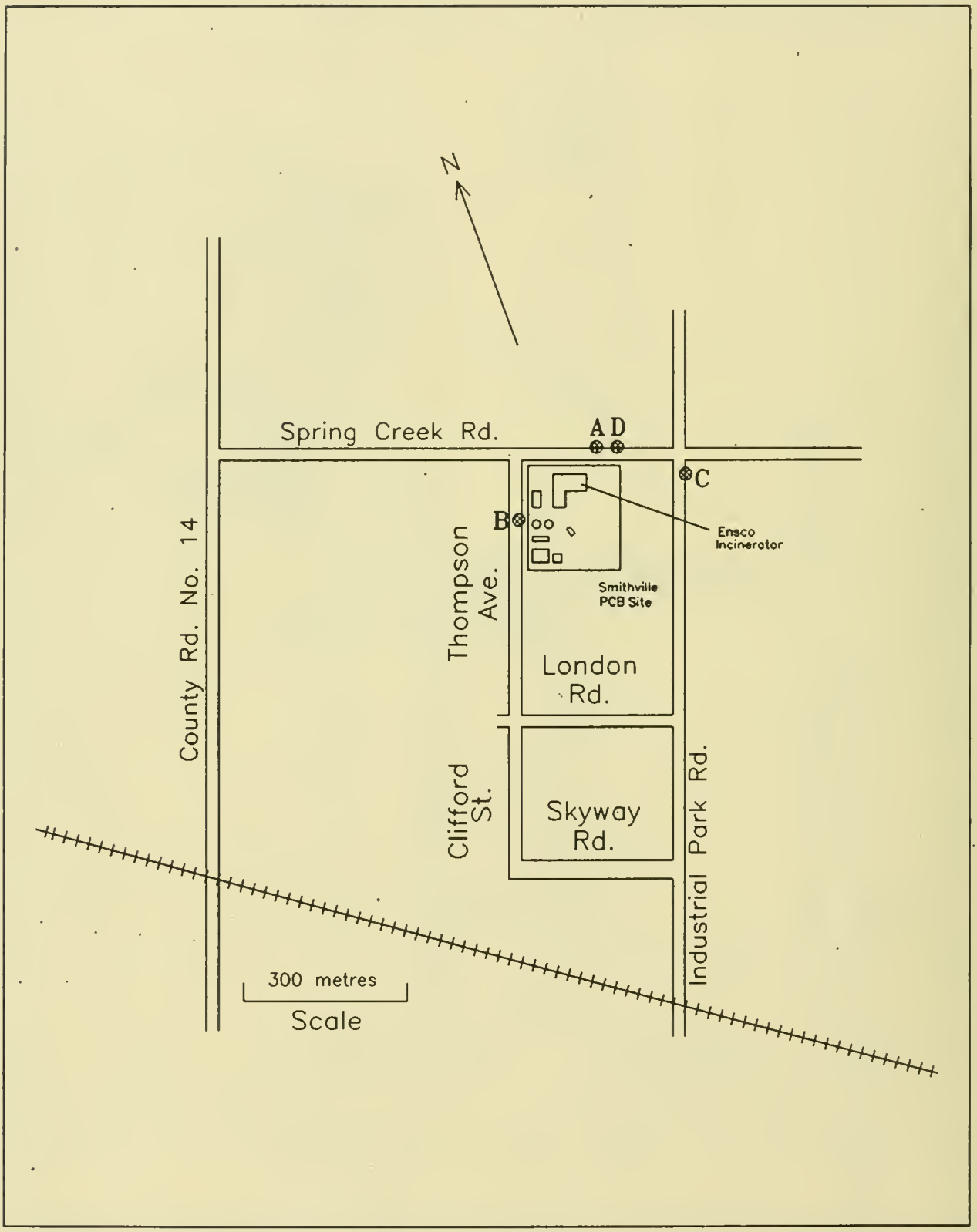


Figure 2.2.1: Monitoring Sites for PCBs During Phase II Survey, Smithville (January 1991).

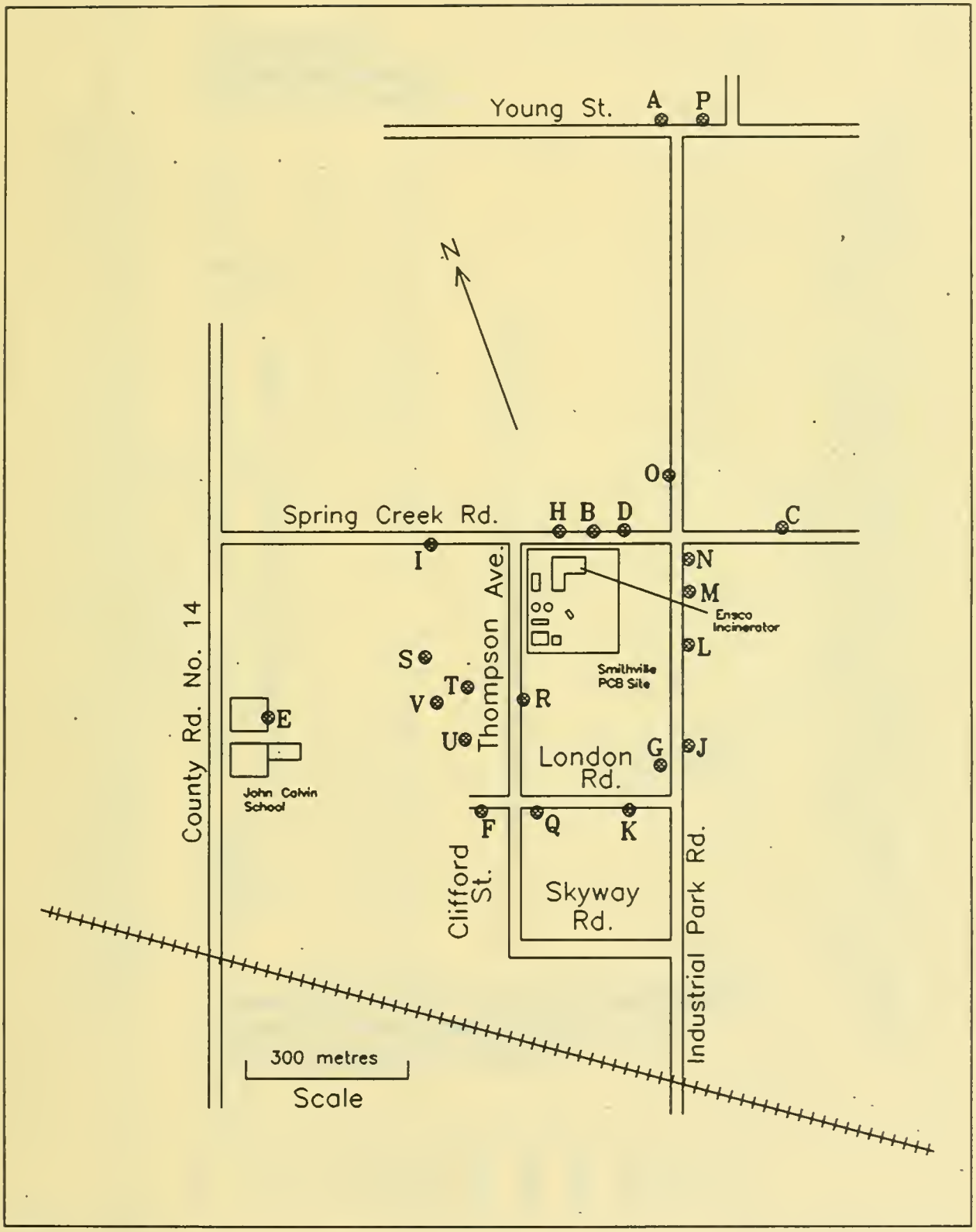


Figure 2.3.1: Monitoring Sites for PCBs During Phase III Survey, Smithville (February 1991).

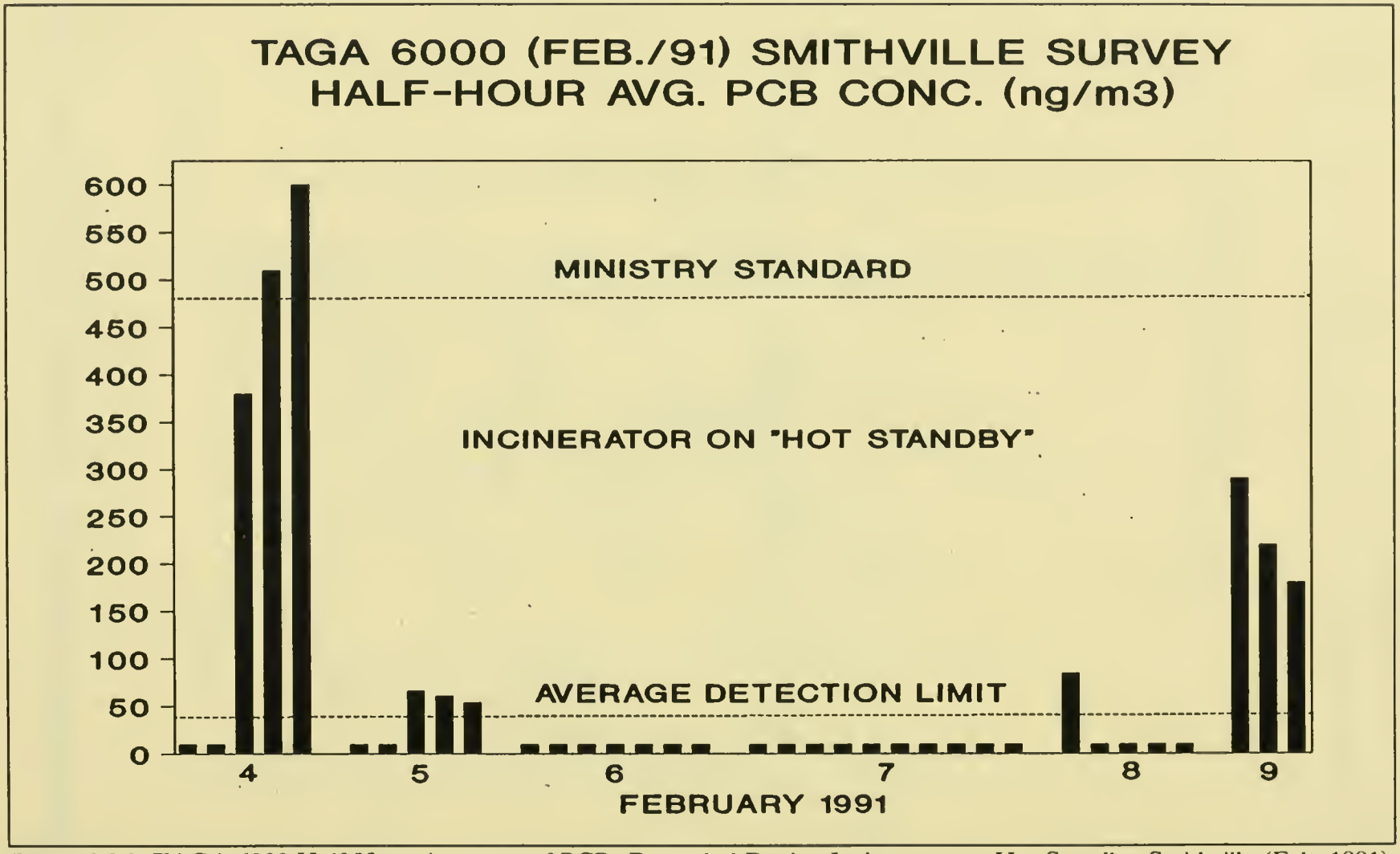


Figure 2.3.2: TAGA 6000 Half-Hour Averages of PCBs Recorded During Incinerator on Hot Standby, Smithville (Feb. 1991).

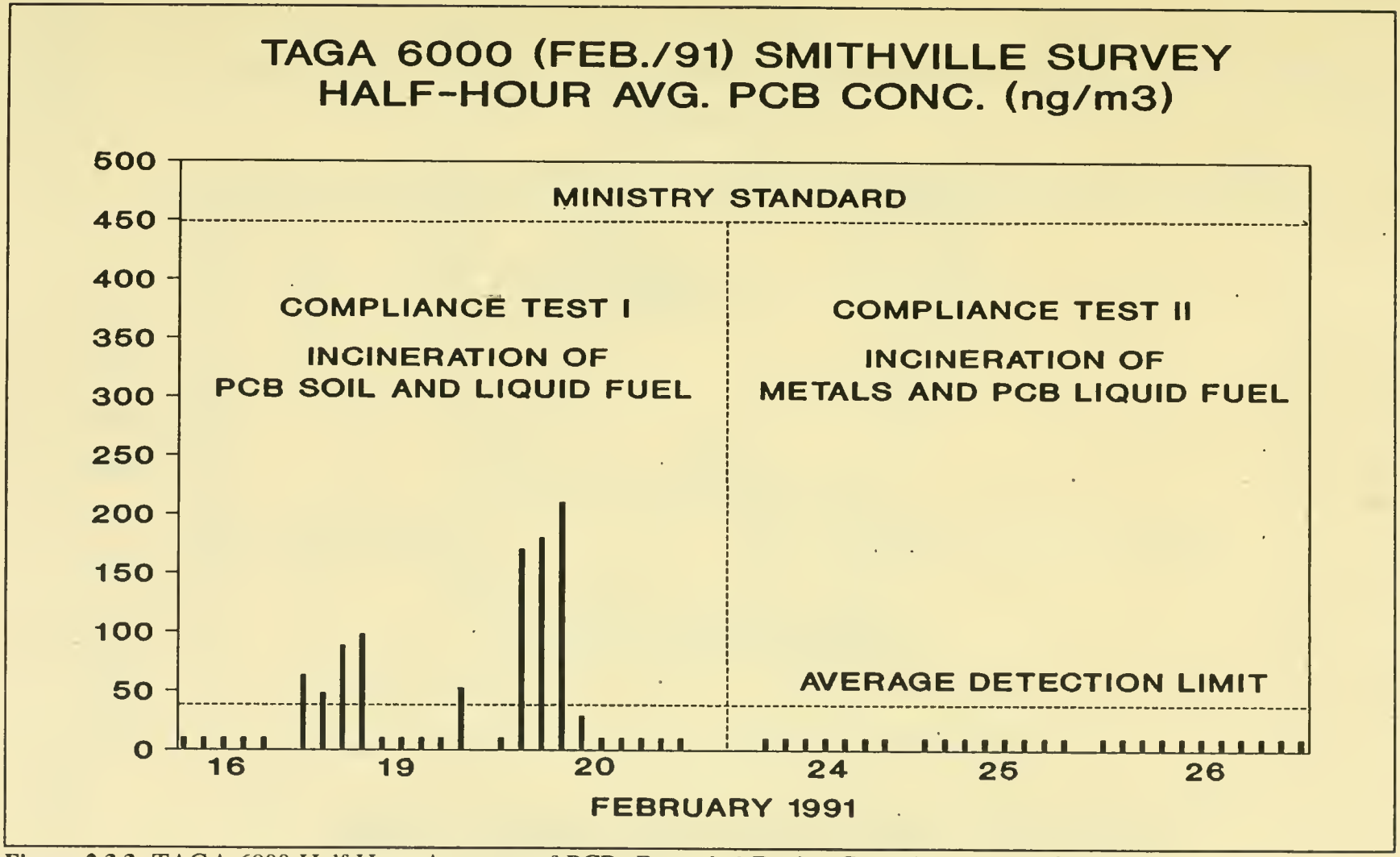


Figure 2.3.3: TAGA 6000 Half-Hour Averages of PCBs Recorded During Compliance Tests, Smithville (February 1991).

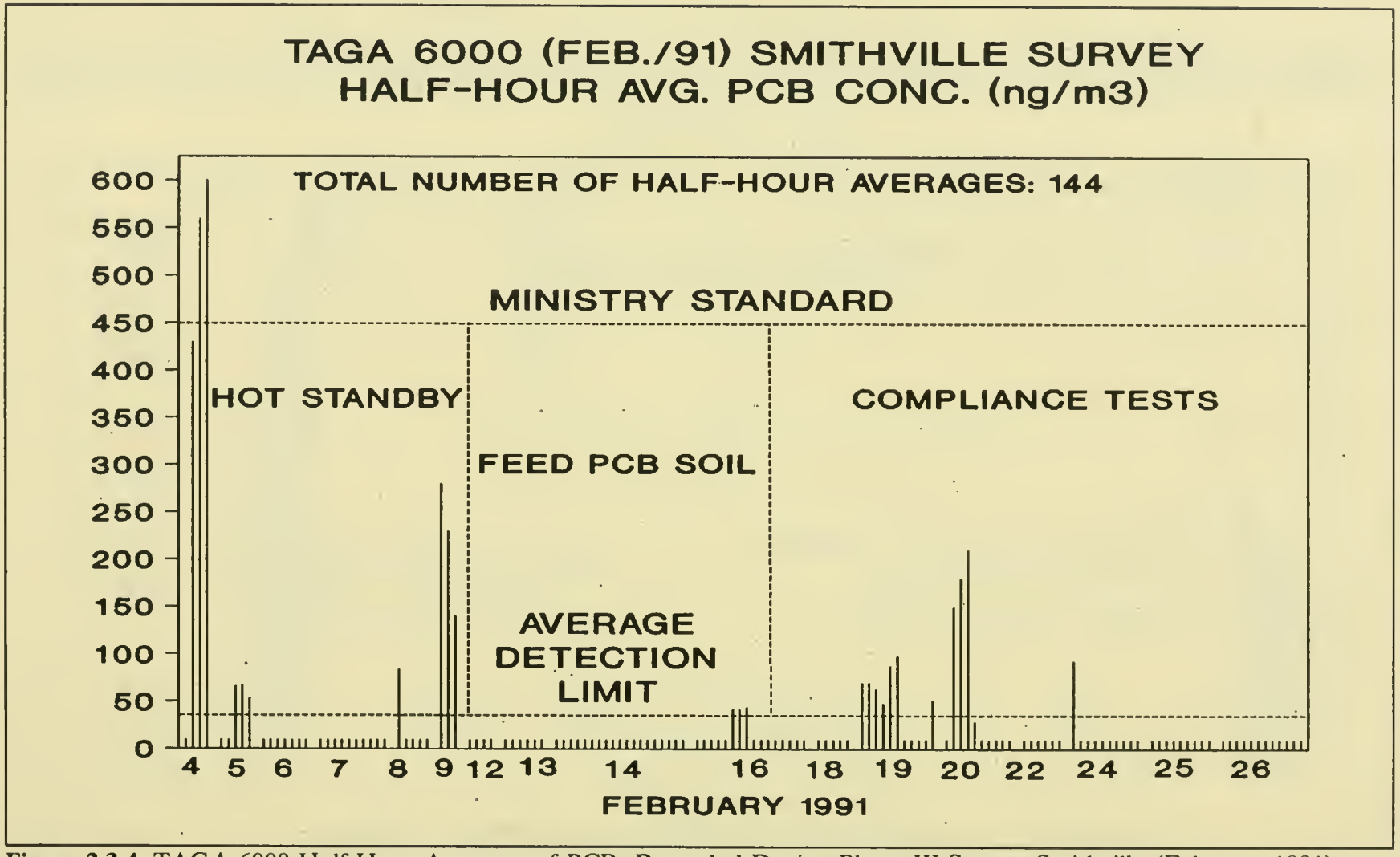


Figure 2.3.4: TAGA 6000 Half-Hour Averages of PCBs Recorded During Phase III Survey, Smithville (February 1991).

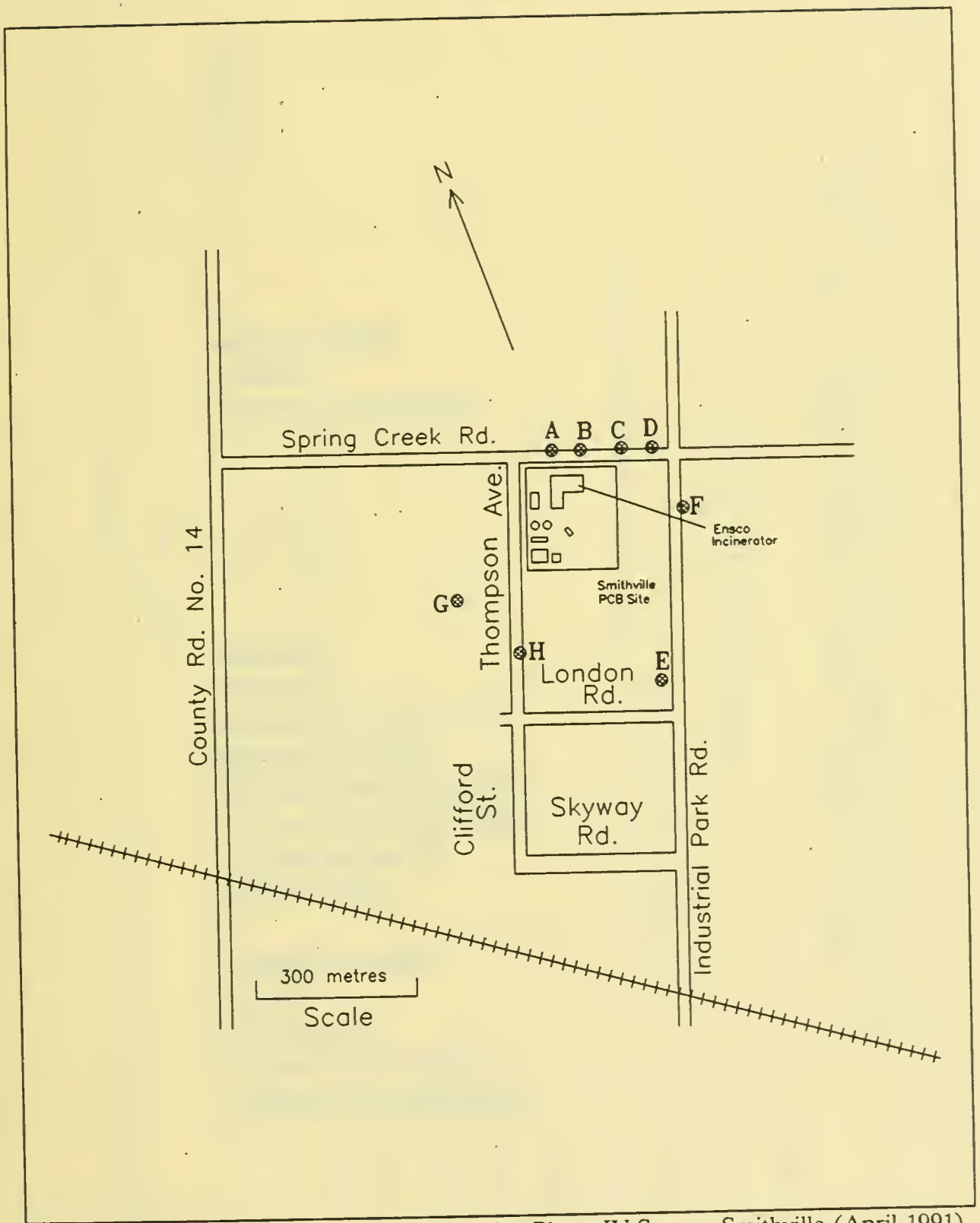


Figure 2.4.1: Monitoring Sites for PCBs During Phase IV Survey, Smithville (April 1991).

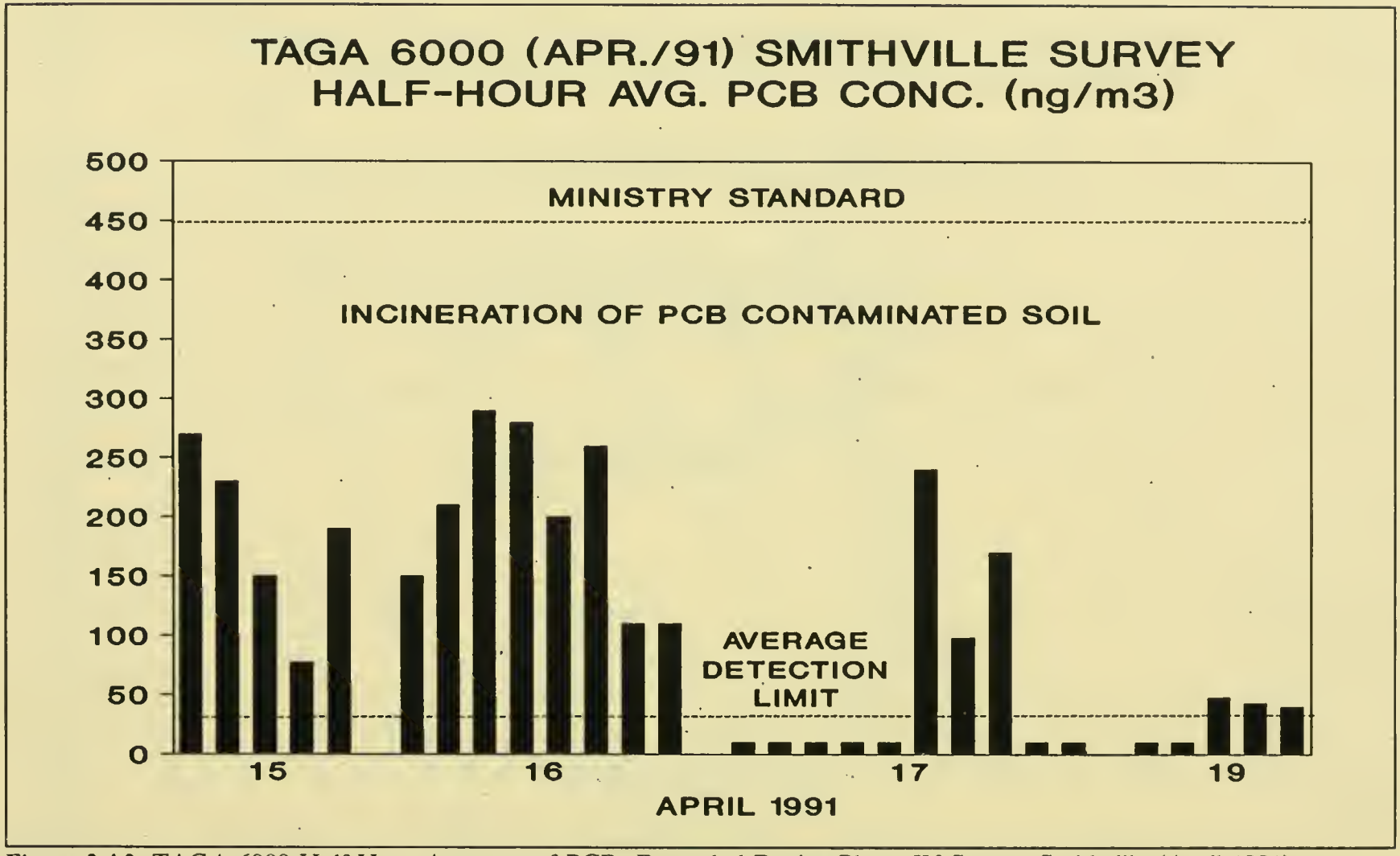


Figure 2.4.2: TAGA 6000 Half-Hour Averages of PCBs Recorded During Phase IV Survey, Smithville (April 1991).

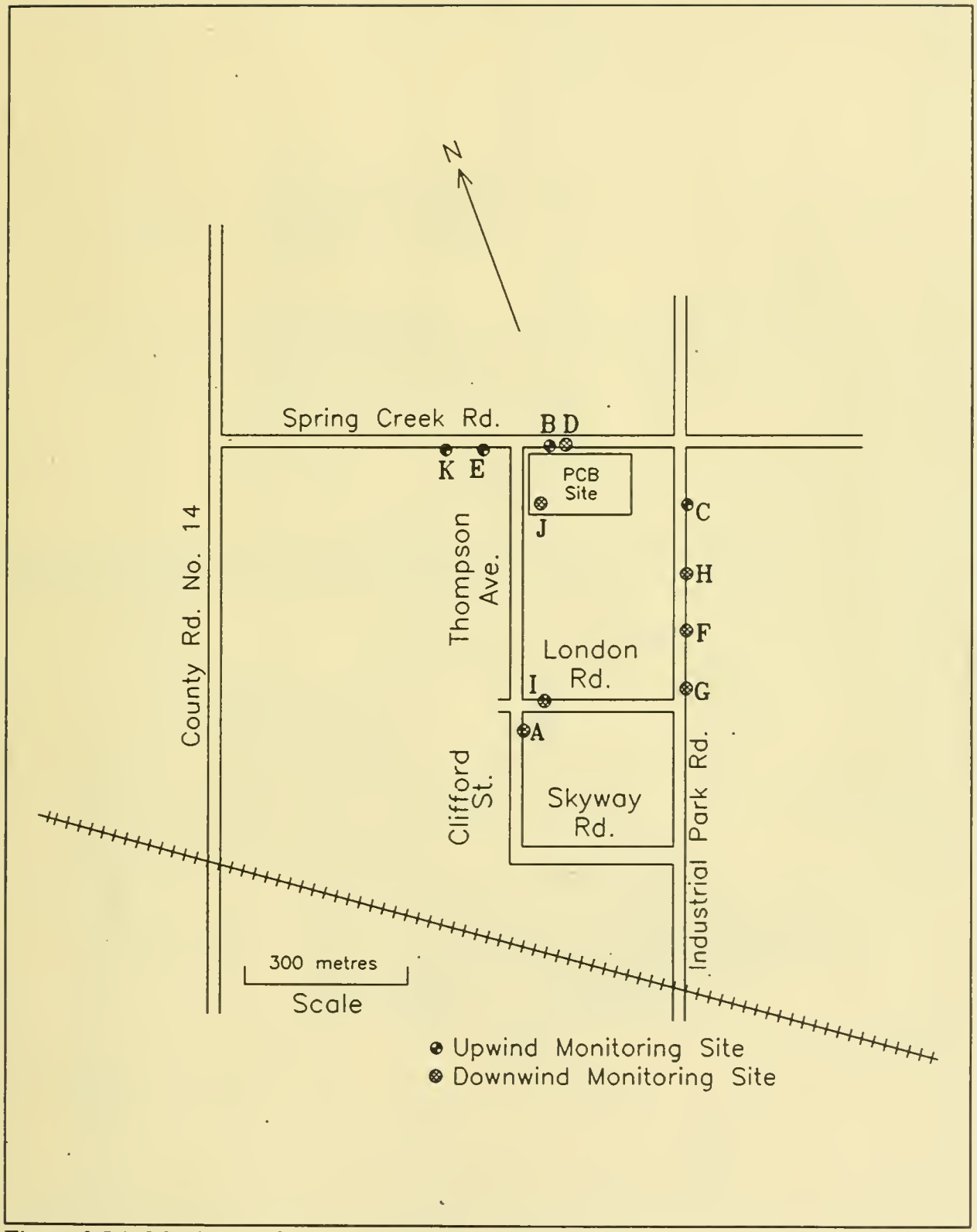


Figure 2.5.1: Monitoring Sites for PCBs During Phase V Survey, Smithville (April 1993).

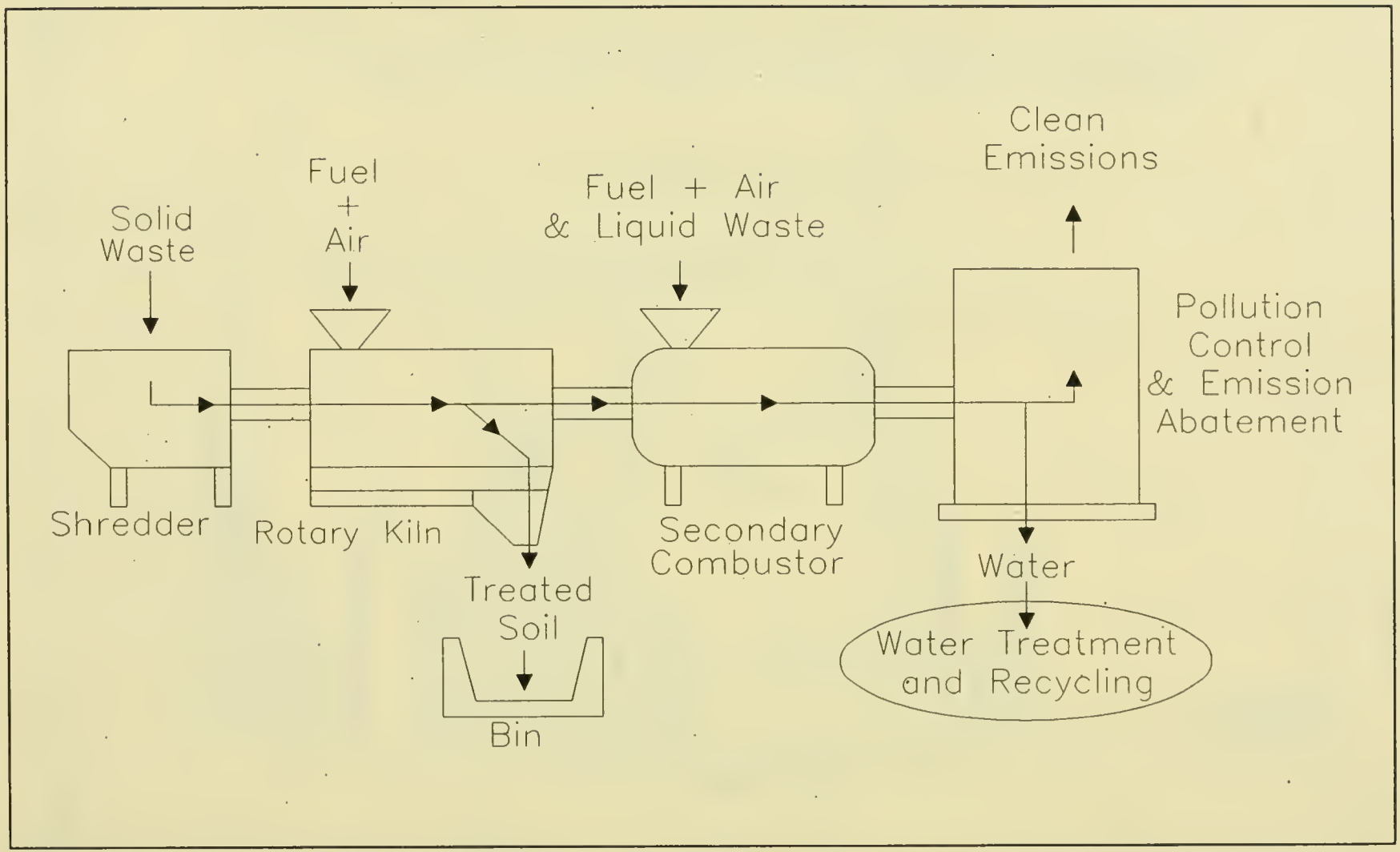


Figure 5.1.1: Schematic of the Ensco Incinerator.

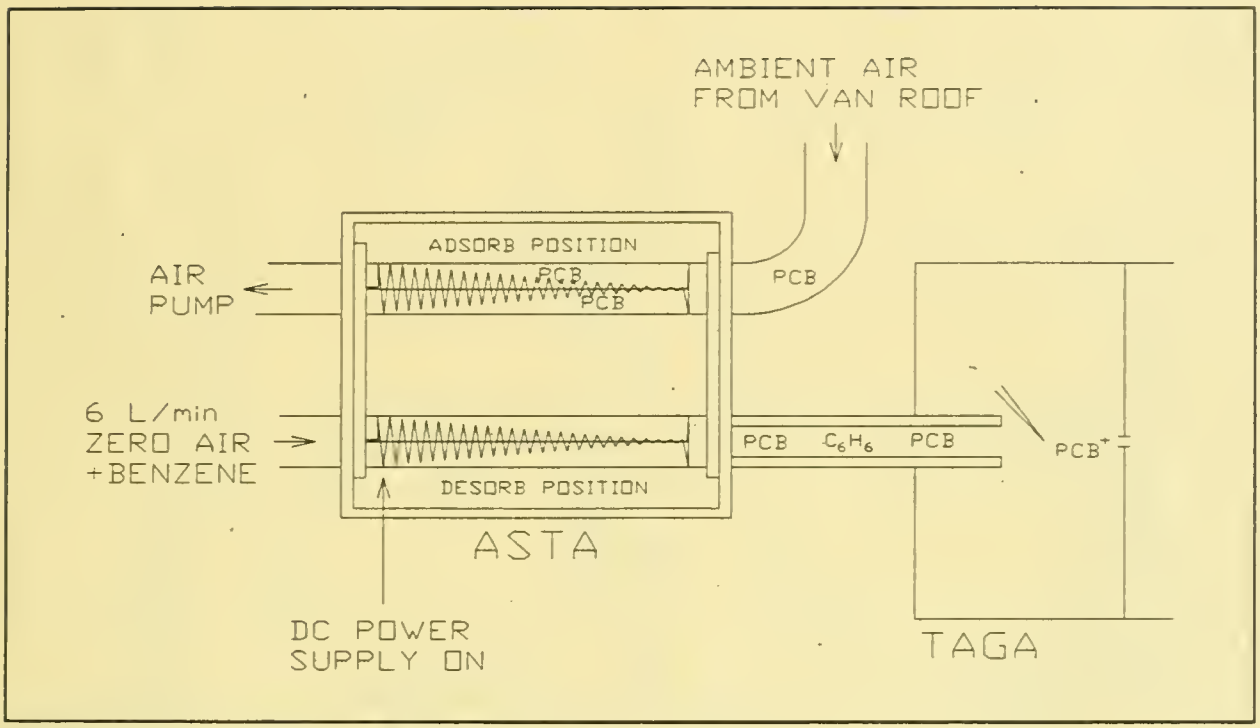


Figure 5.2.1: Schematic of the ASTA Sampling System.

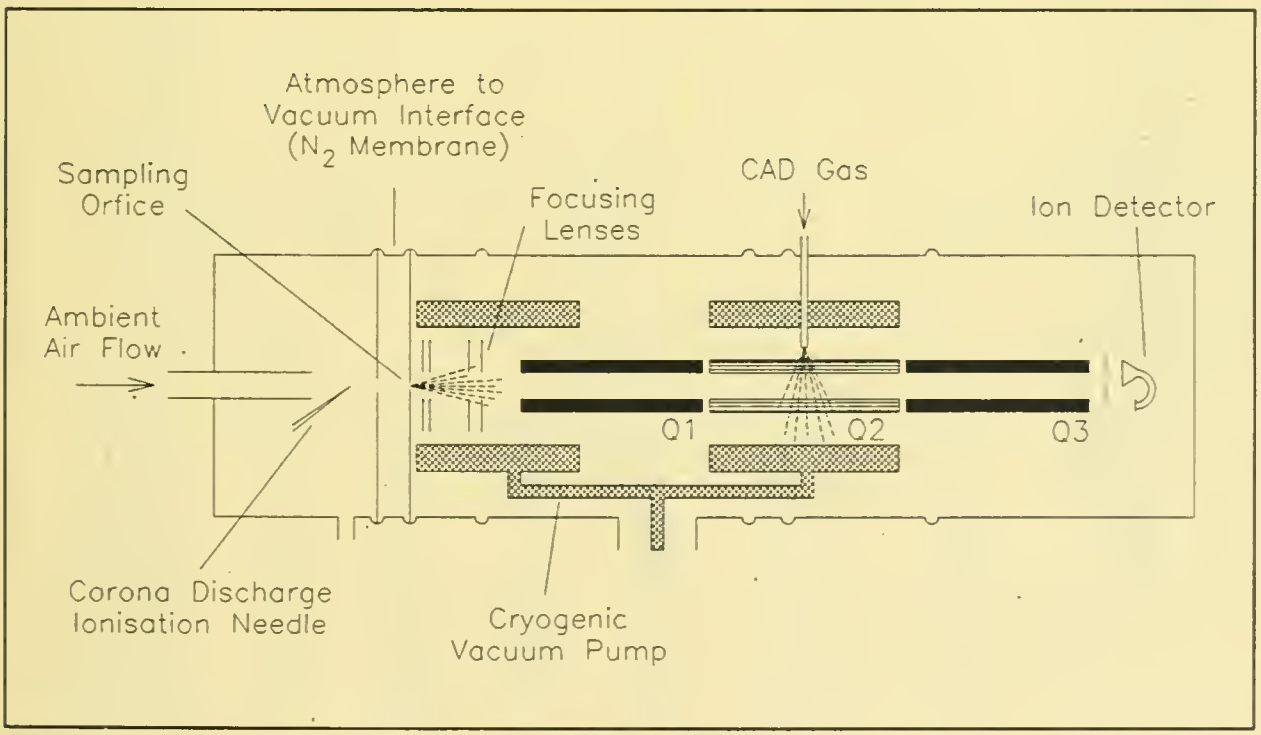


Figure 5.2.2: Schematic of the TAGA 6000 MS/MS Analyzer.

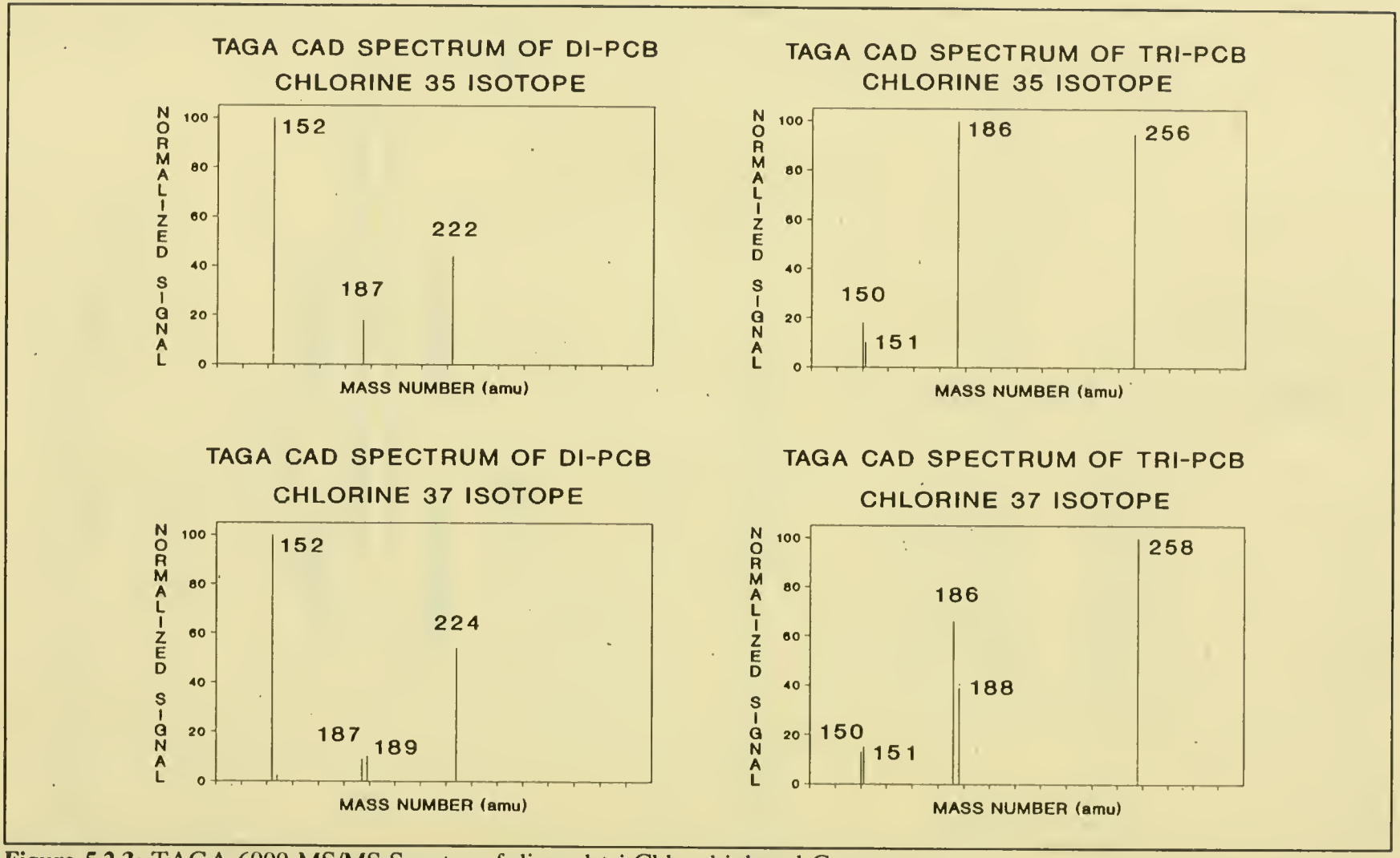
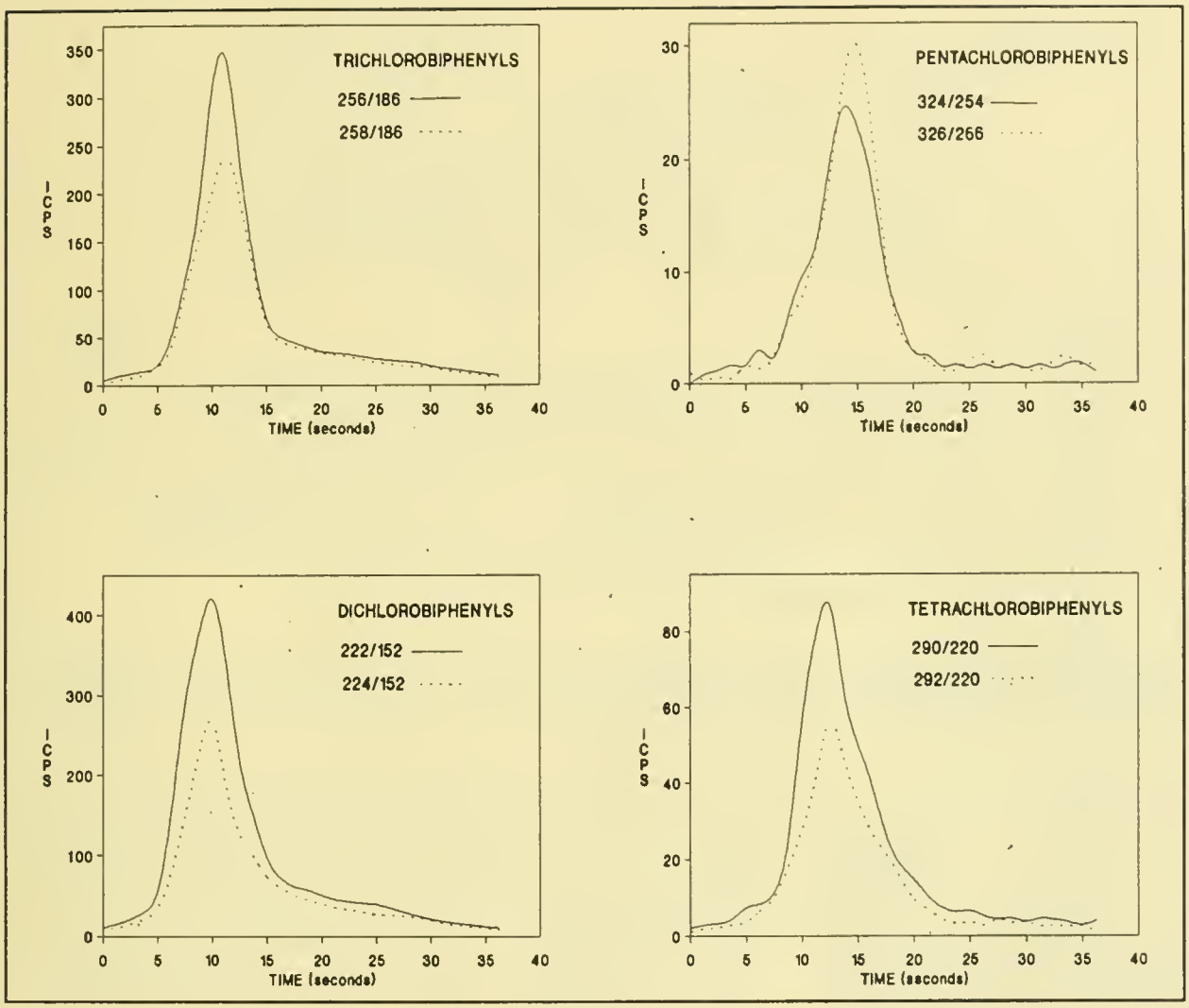


Figure 5.2.3: TAGA 6000 MS/MS Spectra of di- and tri-Chlorobiphenyl Congeners.



P/D ION PAIR	MAX. SIGNAL	TIME (s) AT PEAK	INTEGR. IONS	NET IONS	CONC. (ng/m^3)	SIGNAL RATIO	THEOR. RATIO
222/152	430	10.96	3115	2763	118.60	1.526	1.540
224/152	298	10.40	2026	1811	122.34	0.655	0.650
256/186	368	11.76	2373	2243	269.59	1.433	1.540
258/186	262	11.84	1646	1566	311.27	0.698	0.650
290/220	94	11.92	613	574	162.08	1.408	1.540
292/220	66	12.00	432	408	175.66	0.710	0.650
324/254	25	13.36	136	121	93.89	1.224	1.025
326/256	33	15.36	111	99	87.55	0.817	0.976

Figure 5.2.4: Desorption Curves of di-, tri-, tetra- and penta-Chlorobiphenyls.

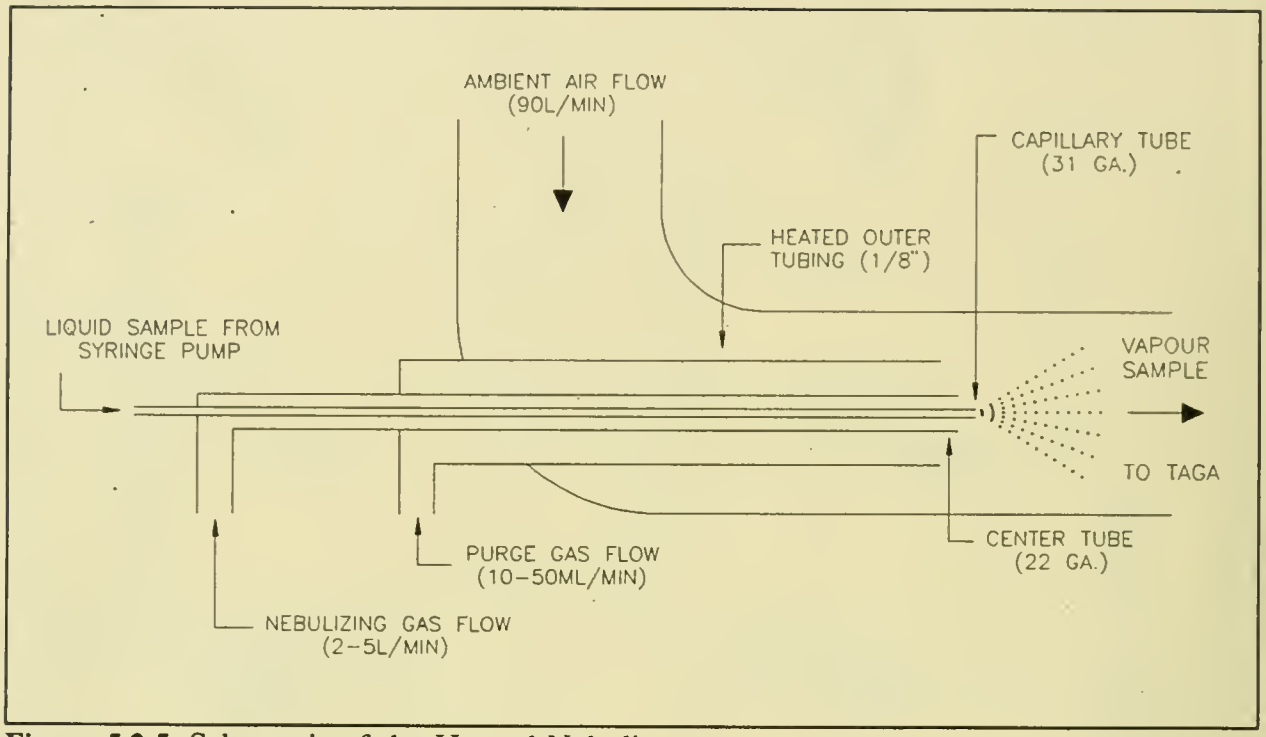


Figure 5.2.5: Schematic of the Heated Nebulizer.

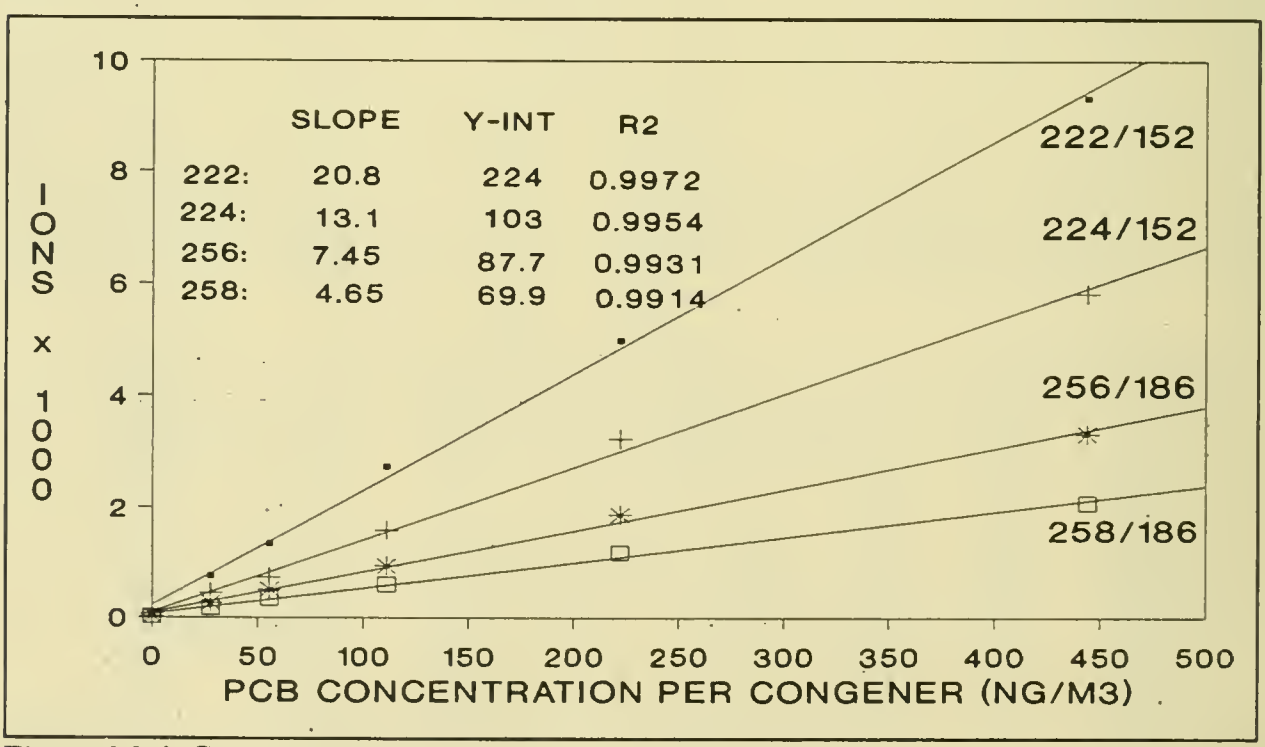


Figure 5.2.6: Calibration Plots of di- and tri-Chlorobiphenyls.

Table 2.1.1: Mobile TAGA 6000 Monitoring Results in Smithville (June 1990)
Selected PCB Congener Group Concentrations (Half-Hour Averages)

Date	Sample Number	Start Time	Site[1]	Meteorological Conditions[2] AT	WS	WD	Total PCBs[3] (ng/m³)	DL[4] (ng/m³) di-	tri-	tetra-	penta-	Comments
June 5	S01	17:18	A	20	25-35	SW	**nd**[5]	24	18	22	33	Sunny, DW[5] of site
June 6	S02	11:39	B	22	20-45	SW	**nd**	8.6	12	23	42	Partial cloudy, DW of site
	S03	12:11	B	23	30-50	SW	**nd**	8.6	12	23	42	Partial cloudy, DW of site
	S04	12:43	B	23	35-55	SW	**nd**	8.6	12	23	42	Partial cloudy, DW of site
	S05	13:15	B	23	35-50	SW	**nd**	8.6	12	23	42	Partial cloudy, DW of site
	S06	14:46	C	23	30-45	SW	**nd**	8.6	12	23	42	Partial cloudy, DW of site
	S07	15:18	C	23	20-40	SW	**nd**	8.6	12	23	42	Partial cloudy, DW of site
	S08	15:50	C	23	25-20	SW	**nd**	8.6	12	23	42	Partial cloudy, DW of site
	S09	16:59	B	23	25-45	SW	**nd**	8.6	12	23	42	Partial cloudy, DW of site
	S10	17:31	B	22	25-35	SW	**nd**	8.6	12	23	42	Partial cloudy, DW of site
June 7	S11	10:49	D	23	15-25	W	**nd**	6.6	8.2	16	28	Sunny, nearly DW
	S12	11:21	D	24	10-25	W	**nd**	6.6	8.2	16	28	Sunny, nearly DW
	S13	11:53	D	24	15-25	W	**nd**	6.6	8.2	16	28	Sunny, nearly DW
	S14	12:25	D	24	10-25	W	**nd**	6.6	8.2	16	28	Sunny, nearly DW
	S15	13:27	D	25	15-30	W	**nd**	6.6	8.2	16	28	Sunny, nearly DW
	S16	13:59	D	25	15-30	W	**nd**	6.6	8.2	16	28	Sunny, nearly DW
	S17	14:51	E	25	10-25	NW	**nd**	6.6	8.2	16	28	Sunny, winds shifted
	S18	15:49	F	26	10-25	NW	**nd**	6.6	8.2	16	28	Sunny, DW of site
	S19	16:21	F	26	05-30	N	**nd**	6.6	8.2	16	28	Sunny, winds shifted
June 8	S20	10:56	G	17	00-10	SE	**nd**	5.2	6.5	7.5	15	Light rain, DW of site
	S21	11:28	G	17	05-15	SSE	**nd**	5.2	6.5	7.5	15	Light rain, DW of site
	S22	12:00	G	17	10-15	SSE	**nd**	5.2	6.5	7.5	15	Light rain, DW of site
	S23	12:32	G	17	10-15	SSE	**nd**	5.2	6.5	7.5	15	Light rain, DW of site

Notes: 1. See Figure 2.1.1 for monitoring locations.
2. Met. conditions at 10 metres: AT=ambient temperature (°C); WS=range of wind speeds (km/hr); WD=predominant wind direction.
3. Quoted PCB concentrations (Conc) are background subtracted and are sum of di-, tri-, tetra- and penta-chlorobiphenyl congeners.
4. Each quoted detection limit (DL) is the average detection limit of two parent/daughter ion pairs for di-, tri-, tetra- and penta-chlorobiphenyl congeners.
5. nd=not detected; DW=downwind.

Table 2.2.1: Mobile TAGA 6000 Monitoring Results in Smithville (January 1991)
Selected PCB Congener Group Concentrations (Half-Hour Averages)

Date	Sample Number	Start Time	Site[1]	Meteorological Conditions[2] AT	WS	WD	Total PCBs[3] (ng/m^3)	DL[5] (ng/m^3) di-	tri-	tetra-	penta-	Comments
Jan. 14	S01	15:25	A	2	25-55	SW	**det**[6]	6.4	7.4	6.5	9.4	Solvent odour, DW[6] of soil
	S02	16:14	A	2	25-45	SW	**det**	6.4	7.4	6.5	9.4	Solvent odour, DW of soil
	S03	16:56	A	2	25-45	SW	**det**	6.4	7.4	6.5	9.4	IS[4], Solvent odour, DW of soil
Jan. 15	S04	11:59	A	5	00-10	WSW	**280**	8.6	14	11	10	Solvent odour, DW of soil
	S05	12:31	A	5	00-05	WSW	**270**	8.6	14	11	10	Solvent odour, DW of soil
	S06	13:16	A	5	00-05	WSW	**150**	8.6	14	11	10	IS, solvent odour, DW of soil
	S07	13:48	A	5	calm	-	**nd**[6]	8.6	14	11	10	IS, calm wind, no odour
	S08	14:29	A	5	calm	-	**nd**	8.6	14	11	10	Calm wind, no odour
	S09	15:01	A	5	calm	-	**nd**	8.6	14	11	10	Calm wind, no odour
	S10	15:33	A	5	calm	-	**nd**	8.6	14	11	10	Calm wind, no odour
Jan. 16	S11	16:21	B	3	10-20	N	**nd**	8.9	10	7.7	10	Foggy, no odour
	S12	16:53	B	3	00-20	N	**nd**	8.9	10	7.7	10	Foggy, no odour
	S13	17:25	B	3	00-15	N	**nd**	8.9	10	7.7	10	Foggy, no odour
	S14	18:02	B	3	00-10	N	**nd**	8.9	10	7.7	10	IS, light rain, no odour
Jan. 17	S15	11:11	C	5	05-15	W	**nd**	19	14	8.4	12	Obstructed by trees, no odour
	S16	11:43	C	4	05-10	W	**nd**	19	14	8.4	12	Obstructed by trees, no odour
	S17	12:15	C	3	05-15	W	**nd**	19	14	8.4	12	Obstructed by trees, no odour
	S18	12:52	C	3	05-10	W	**nd**	19	14	8.4	12	IS, behind trees, no odour
	S19	13:51	D	1	15-40	W	**nd**	19	14	8.4	12	Occasionally DW, no odour
	S20	14:23	D	1	20-40	W	**nd**	19	14	8.4	12	Occasionally DW, no odour
	S21	14:55	D	1	15-45	W	**nd**	19	14	8.4	12	Occasionally DW, no odour
	S22	15:27	D	1	15-40	W	**nd**	19	14	8.4	12	Occasionally DW, no odour
Jan. 18	S23	11:01	A	-1	30-65	WSW	**nd**	16	15	11	15	Windy, DW of soil, mild odour
	S24	11:33	A	-1	25-60	WSW	**nd**	16	15	11	15	Windy, DW of soil, mild odour
	S25	12:05	A	-1	30-55	WSW	**nd**	16	15	11	15	Windy, DW of soil, no odour
	S26	12:46	A	-1	25-55	WSW	**nd**	16	15	11	15	IS, windy, DW of soil, no odour

Notes:
1. See Figure 2.2.1 for monitoring locations.
2. Met. conditions at 10 metres: AT=ambient temperature (°C); WS=range of wind speeds (km/hr); WD=predominant wind direction.
3. Quoted PCB concentrations (Conc) are background subtracted and refer to the sum of di-, tri-, tetra- and penta-chlorobiphenyl congeners.
4. IS=internal standard (deuterated tetra-chlorobiphenyl); spiked during downwind monitoring of di-, tri- and tetra-chlorobiphenyl congeners.
5. Each quoted detection limit (DL) is the average detection limit of two parent/daughter ion pairs for di-, tri-, tetra- and penta-chlorobiphenyl congeners.
6. nd=not detected; det.=detected above total DL but below total quantitation limit (3.3xDL); DW=downwind.

Table 2.3.1: Mobile TAGA 6000 Monitoring Results in Smithville (February 1991)
Selected PCB Congener Group Concentrations (Half-Hour Averages)

Date	Sample Number	Start Time	Site[1]	Met. Data[2] AT	WS	WD	PCB Conc.[3] (ng/m³) di-	tri-	tetra-	penta-	Total	DL[4] (ng/m³) di-	tri-	tetra-	penta-	Dist.[6]	Comments
Feb. 04	S01	14:34	A	13	35-55	SW	nd[7]	nd	nd	nd	nd	8.5	11	18	23	1 km	Incinerator on hot standby
	S02	15:06	A	13	35-55	SW	nd	nd	nd	nd	nd	8.5	11	18	23	1 km	Incinerator on hot standby
	S03	16:06	B	12	25-35	SW	85	190	100	det.[7]	380	8.5	11	18	23	50 m	Incinerator on hot standby
	S04	16:38	B	11	25-35	SW	110	260	140	det.	510	8.5	11	18	23	50 m	Incinerator on hot standby
	S05	17:15	B	10	25-35	SW	110	240	250	na[5]	600	8.5	11	18	23	50 m	IS[5], incinerator on hot standby
Feb. 05	S06	12:39	C	07	00-10	W	nd	nd	nd	nd	nd	4.7	11	10	10	1/2 km	Incinerator on hot standby
	S07	13:11	C	07	00-10	W	nd	nd	nd	nd	nd	4.7	11	10	10	1/2 km	Incinerator on hot standby
	S08	14:00	D	06	10-20	W	det.	det.	det.	nd	det.	4.7	11	10	10	75 m	Incinerator on hot standby
	S09	14:32	D	06	10-20	W	det.	det.	det.	nd	det.	4.7	11	10	10	75 m	Incinerator on hot standby
	S10	15:11	D	07	10-20	W	det.	det.	det.	na	det.	4.7	11	10	10	75 m	IS, incinerator on hot standby
Feb. 06	S11	12:38	E	06	00-10	NE	nd	nd	nd	nd	nd	5.7	7.5	6.1	7.1	3/4 km	Incinerator on hot standby
	S12	13:10	E	06	00-10	NNE	nd	nd	nd	nd	nd	5.7	7.5	6.1	7.1	3/4 km	Incinerator on hot standby
	S13	13:42	E	05	05-10	NE	nd	nd	nd	nd	nd	5.7	7.5	6.1	7.1	3/4 km	Incinerator on hot standby
	S14	15:02	F	04	05-15	NE	nd	nd	nd	na	nd	5.7	7.5	6.1	7.1	1/2 km	IS, incinerator on hot standby
	S15	15:34	F	04	05-10	NE	nd	nd	nd	na	nd	5.7	7.5	6.1	7.1	1/2 km	IS, incinerator on hot standby
	S16	16:11	F	03	05-10	NE	nd	nd	nd	nd	nd	5.7	7.5	6.1	7.1	1/2 km	Incinerator on hot standby
	S17	16:43	F	03	05-15	NNE	nd	nd	nd	nd	nd	5.7	7.5	6.1	7.1	1/2 km	Incinerator on hot standby
Feb. 07	S18	10:41	G	05	20-30	N	nd	nd	nd	nd	nd	5.8	9.5	7.3	10	1/2 km	Incinerator on hot standby
	S19	11:13	G	06	15-25	N	nd	nd	nd	nd	nd	5.8	9.5	7.3	10	1/2 km	Incinerator on hot standby
	S20	11:45	G	07	15-25	N	nd	nd	nd	nd	nd	5.8	9.5	7.3	10	1/2 km	Incinerator on hot standby
	S21	12:17	G	06	20-30	N	nd	nd	nd	nd	nd	5.8	9.5	7.3	10	1/2 km	Incinerator on hot standby
	S22	13:02	G	06	20-25	N	nd	nd	nd	na	nd	5.8	9.5	7.3	10	1/2 km	IS, incinerator on hot standby
	S23	13:34	G	06	20-30	N	nd	nd	nd	na	nd	5.8	9.5	7.3	10	1/2 km	IS, incinerator on hot standby
	S24	14:19	G	06	20-25	N	nd	nd	nd	nd	nd	5.8	9.5	7.3	10	1/2 km	Incinerator on hot standby
	S25	14:51	G	06	20-30	N	nd	nd	nd	nd	nd	5.8	9.5	7.3	10	1/2 km	Incinerator on hot standby
	S26	15:23	G	06	15-25	N	nd	nd	nd	nd	nd	5.8	9.5	7.3	10	1/2 km	Incinerator on hot standby
	S27	16:06	G	06	15-25	N	nd	nd	nd	na	nd	5.8	9.5	7.3	10	1/2 km	IS, incinerator on hot standby

Table 2.3.1 (Cont'd)

Date	Sample Number	Start Time	Site[1]	Met. Data[2] AT	WS	WD	PCB Conc.[3] (ng/m³) di-	tri-	tetra-penta-	Total	DL[4] (ng/m³) di-	tri-	tetra-penta-		Dist.[6]	Comments
Feb. 08	S28	14:16	H	04	05-10	SW	det.	43	19	nd	**det.**	7.5	11	5.3	8.4	30 m	Incinerator on hot standby
	S29	14:48	H	03	10-20	SW	nd	det.	det.	nd	**nd**	7.5	11	5.3	8.4	30 m	Incinerator on hot standby
	S30	15:20	H	03	10-30	SW	nd	nd	nd	nd	**nd**	7.5	11	5.3	8.4	30 m	Incinerator on hot standby
	S31	15:57	H	04	10-30	SW	nd	nd	nd	na	**nd**	7.5	11	5.3	8.4	30 m	IS, incinerator on hot standby
	S32	16:29	H	03	15-30	SW	nd	nd	nd	na	**nd**	7.5	11	5.3	8.4	30 m	IS, incinerator on hot standby
Feb. 09	S33	13:32	B	06	20-30	SW	60	130	98	nd	**290**	6.1	7.7	11	17	50 m	Incinerator on hot standby
	S34	14:04	B	05	20-35	SW	42	100	82	nd	**220**	6.1	7.7	11	17	50 m	Incinerator on hot standby
	S35	14:42	B	04	20-40	SW	24	61	56	na	**140**	6.1	7.7	11	17	50 m	IS, incinerator on hot standby
Feb. 12	S36	16:35	H	-06	10-30	SW	det.	det.	nd	nd	**nd**	4.6	8.0	12	25	50 m	3 ppm PCB waste soil fed for incineration
	S37	17:07	H	-06	10-25	SW	det.	det.	nd	nd	**nd**	4.6	8.0	12	25	50 m	PCB waste soil feeding continued
	S38	17:39	H	-06	10-25	SW	det.	det.	nd	nd	**nd**	4.6	8.0	12	25	50 m	40% PCB liquid fuel also added by last for 15 min.
	S39	18:18	H	-06	10-15	SW	det.	det.	det.	na	**nd**	4.6	8.0	12	25	50 m	IS, 3 ppm PCB waste soil fed for incineration only
Feb. 13	S40	11:59	I	-02	10-20	SE	nd	nd	nd	nd	**nd**	7.9	8.0	24	55	200 m	<0.58% PCB soil fed for incineration
	S41	12:31	I	-01	10-20	ESE	nd	nd	nd	nd	**nd**	7.9	8.0	24	55	200 m	PCB soil feeding continued
	S42	13:03	I	-02	10-20	ESE	nd	nd	nd	nd	**nd**	7.9	8.0	24	55	200 m	PCB soil feeding continued
	S43	13:35	I	-01	10-20	ESE	nd	nd	nd	nd	**nd**	7.9	8.0	24	55	200 m	PCB soil feeding continued
	S44	14:07	I	-01	10-20	E	nd	nd	nd	nd	**nd**	7.9	8.0	24	55	200 m	Incinerator on hot standby
	S45	14:58	I	-01	10-20	E	nd	nd	nd	na	**nd**	7.9	8.0	24	55	200 m	IS, incinerator on hot standby
Feb. 14	S46	10:36	G	00	05-15	NNW	nd	nd	nd	nd	**nd**	6.6	7.5	6.4	8.6	400 m	<0.58% PCB soil fed for incineration
	S47	11:23	J	00	15-20	N	nd	nd	nd	nd	**nd**	6.6	7.5	6.4	8.6	300 m	PCB soil feeding stopped due to conveyor problem
	S48	11:55	J	00	10-20	N	nd	nd	nd	nd	**nd**	6.6	7.5	6.4	8.6	300 m	PCB soil feeding stopped due to conveyor problem
	S49	13:02	K	00	20-30	N	nd	nd	nd	nd	**nd**	6.6	7.5	6.4	8.6	400 m	<0.58% PCB soil fed for incineration
	S50	13:34	K	00	20-30	N	nd	nd	nd	nd	**nd**	6.6	7.5	6.4	8.6	400 m	PCB soil feeding continued
	S51	14:06	K	00	15-25	N	nd	nd	nd	nd	**nd**	6.6	7.5	6.4	8.6	400 m	PCB soil feeding continued
	S52	14:43	K	00	15-20	NNW	nd	nd	nd	na	**nd**	6.6	7.5	6.4	8.6	400 m	IS, PCB soil feeding continued
	S53	15:31	L	-01	05-15	NW	nd	nd	nd	nd	**nd**	6.6	7.5	6.4	8.6	300 m	PCB soil feeding continued
	S54	16:03	L	-03	10-15	NW	nd	nd	nd	nd	**nd**	6.6	7.5	6.4	8.6	300 m	PCB soil feeding continued
	S55	16:35	L	-02	05-15	WNW	nd	nd	nd	nd	**nd**	6.6	7.5	6.4	8.6	300 m	PCB soil feeding continued
	S56	17:07	M	-03	calm	-	nd	nd	nd	nd	**nd**	6.6	7.5	6.4	8.6	250 m	PCB liquid fuel also added for incineration

Table 2.3.1 (Cont'd)

Date	Sample Number	Start Time	Site[1]	Met. Data[2] AT	WS	WD	PCB Conc.[3] (ng/m³) di-	tri-	tetra-penta-	Total	DL[4] (ng/m³) di-	tri-	tetra-	penta-	Dist.[6]	Comments
Feb. 14	S57	18:03	M	-03	calm	-	nd	nd	nd	nd	6.6	7.5	6.4	8.6	250 m	PCB soil and PCB liquid fuel feeding continued
	S58	18:35	M	-03	calm	-	nd	nd	nd	nd	6.6	7.5	6.4	8.6	250 m	PCB feeding continued
	S59	19:07	M	-03	calm	-	nd	nd	nd	nd	6.6	7.5	6.4	8.6	250 m	PCB feeding continued, stack testing commenced
	S60	19:39	M	-03	calm	-	nd	nd	nd	nd	6.6	7.5	6.4	8.6	250 m	PCB feeding and stack testing continued
	S61	20:33	M	-03	00-05	WSW	nd	nd	nd	na	6.6	7.5	6.4	8.6	250 m	IS, PCB feeding and stack testing continued
	S62	21:30	C	-04	05-15	W	nd	nd	nd	nd	6.6	7.5	6.4	8.6	400 m	PCB feeding and stack testing continued
	S63	22:02	C	-05	00-10	W	nd	nd	nd	nd	6.6	7.5	6.4	8.6	400 m	PCB liquid fuel feeding stopped, stack testing continued
	S64	22:34	C	-05	00-10	W	nd	nd	nd	nd	6.6	7.5	6.4	8.6	400 m	PCB soil feeding continued, stack testing stopped
Feb. 16	S65	12:01	O	-11	40-60	WSW	nd	nd	nd	nd	4.5	3.6	3.7	5.5	300 m	PCB soil feeding stopped due to conveyor problem
	S66	12:33	O	-11	40-50	WSW	nd	nd	nd	nd	4.5	3.6	3.7	5.5	300 m	PCB soil feeding stopped due to conveyor problem
	S67	13:05	O	-10	40-50	WSW	nd	nd	nd	nd	4.5	3.6	3.7	5.5	300 m	PCB soil feeding stopped due to conveyor problem
	S68	13:37	O	-10	40-60	WSW	nd	nd	nd	nd	4.5	3.6	3.7	5.5	300 m	PCB soil feeding stopped due to conveyor problem
	S69	14:09	O	-10	40-50	WSW	nd	nd	nd	nd	4.5	3.6	3.7	5.5	300 m	PCB soil feeding stopped due to conveyor problem
	S70	15:04	B	-09	20-30	SW	16	20	det.	na	4.5	3.6	3.7	5.5	30 m	IS, PCB soil feeding stopped due to conveyor problem
	S71	15:42	B	-09	25-40	SW	15	19	nd	nd	4.5	3.6	3.7	5.5	30 m	PCB soil feeding stopped due to conveyor problem
	S72	16:14	B	-09	30-40	SW	det.	20	det.	nd	4.5	3.6	3.7	5.5	30 m	PCB soil and PCB liquid waste fuel fed for incineration
	S73	16:46	H	-10	20-35	SW	nd	nd	nd	nd	4.5	3.6	3.7	5.5	50 m	PCB feeding continued
	S74	17:18	H	-10	15-30	SW	nd	nd	nd	nd	4.5	3.6	3.7	5.5	50 m	PCB feeding continued
	S75	17:50	H	-10	15-30	SW	nd	nd	nd	nd	4.5	3.6	3.7	5.5	50 m	PCB feeding continued
	S76	18:32	H	-09	20-35	SW	nd	nd	nd	na	4.5	3.6	3.7	5.5	50 m	IS, PCB feeding continued, stack testing commenced
	S77	19:08	H	-08	15-35	SW	nd	nd	nd	nd	4.5	3.6	3.7	5.5	50 m	PCB feeding and stack testing continued
	S78	19:40	H	-08	15-30	SW	nd	nd	nd	nd	4.5	3.6	3.7	5.5	50 m	PCB feeding and stack testing continued
	S79	20:12	H	-08	10-20	SW	nd	nd	nd	nd	4.5	3.6	3.7	5.5	50 m	PCB feeding and stack testing continued
	S80	20:44	H	-08	10-20	SW	nd	nd	nd	nd	4.5	3.6	3.7	5.5	50 m	PCB feeding and stack testing continued
Feb. 18	S81	16:20	E	3	05-15	ENE	nd	nd	nd	nd	6.3	8.1	5.7	11	3/4 km	PCB soil feeding continued, stack testing commenced
	S82	16:52	E	3	05-15	ENE	nd	nd	nd	nd	6.3	8.1	5.7	11	3/4 km	PCB soil feeding and stack testing continued
	S83	17:24	E	3	05-10	ENE	nd	nd	nd	nd	6.3	8.1	5.7	11	3/4 km	Stack testing held up due to moisture and cooling problems
	S84	17:56	E	2	05-10	ENE	nd	nd	nd	nd	6.3	8.1	5.7	11	3/4 km	Stack testing still held up
	S85	18:34	E	2	05-10	ENE	nd	nd	nd	na	6.3	8.1	5.7	11	3/4 km	IS, stack testing still held up

Table 2.3.1 (Cont'd)

Date	Sample Number	Start Time	Site[1]	Met. Data[2] AT	WS	WD	PCB Conc.[3] (ng/m³) di-	tri-	tetra-penta-	Total	DL[4] (ng/m³) di-	tri-	tetra-penta-		Dist.[6]	Comments
Feb. 19	S86	12:08	H	11	15-30	SSW	23	31	det.	nd	det.	3.9	8.4	5.7	9.2	50 m	0.58% PCB soil fed for incineration
	S87	12:40	H	10	20-30	SSW	23	35	det.	nd	det.	3.9	8.4	5.7	9.2	50 m	31% PCB waste fuel also added for incineration
	S88	13:12	H	10	20-25	SSW	19	30	det.	nd	det.	3.9	8.4	5.7	9.2	50 m	PCB feeding continued, stack testing commenced
	S89	13:53	H	10	20-30	SSW	18	29	nd	na	det.	3.9	8.4	5.7	9.2	50 m	IS, PCB feeding and stack testing continued
	S90	14:29	H	10	20-40	SW	31	43	det.	nd	det.	3.9	8.4	5.7	9.2	50 m	PCB feeding and stack testing continued
	S91	15:01	H	10	20-40	SW	33	50	det.	nd	det.	3.9	8.4	5.7	9.2	50 m	PCB feeding and stack testing continued
	S92	15:59	P	10	35-50	SW	nd	nd	nd	nd	nd	3.9	8.4	5.7	9.2	1.1 km	PCB feeding and stack testing continued
	S93	16:31	P	10	35-50	SW	nd	nd	nd	nd	nd	3.9	8.4	5.7	9.2	1.1 km	PCB feeding and stack testing continued
	S94	17:03	P	09	35-45	SW	nd	nd	nd	nd	nd	3.9	8.4	5.7	9.2	1.1 km	PCB feeding and stack testing continued
	S95	17:35	P	09	30-40	SW	nd	nd	nd	nd	nd	3.9	8.4	5.7	9.2	1.1 km	PCB feeding and stack testing continued
	S96	18:38	B	09	10-20	SW	17	det.	det.	na	det.	3.9	8.4	5.7	9.2	50 m	IS, PCB feeding and stack testing continued
Feb. 20	S97	15:56	D	00	15-30	WSW	nd	nd	nd	nd	nd	7.1	6.3	6.8	5.3	75 m	PCB feeding down, stack testing held up
	S98	16:28	B	00	20-35	SW	45	76	33	det.	150	7.1	6.3	6.8	5.3	50 m	PCB feeding down, stack testing held up
	S99	17:00	B	00	20-30	SW	49	90	37	nd	180	7.1	6.3	6.8	5.3	50 m	PCB feeding and stack testing resumed
	S100	17:32	B	00	20-40	SW	51	97	43	20	210	7.1	6.3	6.8	5.3	50 m	PCB feeding and stack testing continued
	S101	18:19	H	00	10-30	SW	det.	20	nd	na	det.	7.1	6.3	6.8	5.3	30 m	IS, PCB feeding down, stack testing delayed
	S102	18:54	H	00	10-30	SW	nd	det.	nd	nd	nd	7.1	6.3	6.8	5.3	30 m	PCB feeding down, stack testing delayed
	S103	19:26	H	00	10-25	SW	nd	det.	nd	nd	nd	7.1	6.3	6.8	5.3	30 m	PCB feeding down, stack testing delayed
	S104	19:58	H	00	10-20	SW	nd	det.	nd	nd	nd	7.1	6.3	6.8	5.3	30 m	PCB feeding and stack testing resumed
	S105	20:30	H	00	10-20	SW	nd	det.	nd	nd	nd	7.1	6.3	6.8	5.3	30 m	PCB feeding and stack testing continued
	S106	21:07	H	00	00-10	SSW	nd	det.	nd	na	nd	7.1	6.3	6.8	5.3	30 m	IS, PCB feeding and stack testing continued
Feb. 22	S107	19:43	M	-07	00-10	NW	det.	det.	nd	nd	nd	7.5	6.4	5.3	7.8	250 m	Shredded capacitors feeding and stack testing continued
	S108	20:15	M	-08	05-15	NW	det.	det.	nd	nd	nd	7.5	6.4	5.3	7.8	250 m	PCB feeding and stack testing continued
	S109	20:47	M	-08	00-10	NW	nd	det.	nd	nd	nd	7.5	6.4	5.3	7.8	250 m	PCB feeding and stack testing continued
	S110	21:19	M	-09	00-15	NW	nd	det.	nd	nd	nd	7.5	6.4	5.3	7.8	250 m	PCB feeding and stack testing continued
	S111	21:54	M	-09	00-15	NW	nd	det.	nd	na	nd	7.5	6.4	5.3	7.8	250 m	IS, PCB feeding and stack testing completed
	S112	22:32	M	-09	00-15	NNW	nd	nd	nd	nd	nd	7.5	6.4	5.3	7.8	250 m	Incinerator on standby
Feb. 24	S113	13:13	D	05	05-20	SW	det.	45	det.	nd	det.	13	14	8.1	17	75 m	Shredded capacitors and waste fuel fed for incineration
	S114	14:07	Q	04	10-20	NNE	nd	nd	nd	nd	nd	13	14	8.1	17	1/2 km	PCB feeding continued

Table 2.3.1 (Cont'd)

Date	Sample Number	Start Time	Site[1]	Met. Data[2] AT	WS	WD	PCB Conc.[3] (ng/m³) di-	tri-	tetra-penta-	Total	DL[4] (ng/m³) di-	tri-	tetra-	penta-	Dist.[6]	Comments
Feb. 24	S115	14:39	Q	04	10-20	NE	nd	nd	nd	nd	13	14	8.1	17	1/2 km	PCB feeding continued, stack testing commenced
	S116	15:11	Q	04	10-20	NE	nd	nd	nd	nd	13	14	8.1	17	1/2 km	PCB feeding and stack testing continued
	S117	16:04	R	03	15-25	NNE	nd	nd	nd	nd	13	14	8.1	17	250 m	PCB feeding and stack testing continued
	S118	16:36	R	02	10-20	NE	nd	nd	nd	nd	13	14	8.1	17	250 m	PCB feeding and stack testing continued
	S119	17:56	S	01	10-20	NE	nd	nd	nd	na	13	14	8.1	17	200 m	IS, PCB feeding and stack testing continued
	S120	18:54	T	00	10-20	NE	det.	det.	nd	nd	13	14	8.1	17	250 m	PCB feeding and stack testing continued
	S121	19:26	T	-01	05-10	ENE	det.	det.	nd	nd	13	14	8.1	17	250 m	PCB feeding and stack testing completed
	S122	19:58	T	-01	00-05	ENE	nd	det.	nd	nd	13	14	8.1	17	250 m	Incinerator on hot standby
Feb. 25	S123	12:53	E	-01	10-15	ENE	nd	nd	nd	nd	8.0	8.8	5.6	5.6	3/4 km	Shredded capacitors and waste fuel fed for incineration
	S124	13:25	E	-01	10-20	ENE	nd	nd	nd	nd	8.0	8.8	5.6	5.6	3/4 km	PCB feeding continued, stack testing commenced
	S125	14:43	U	-02	20-30	NE	det.	nd	nd	nd	8.0	8.8	5.6	5.6	3/4 km	PCB feeding and stack testing continued
	S126	15:15	U	-02	20-30	NE	det.	det.	nd	nd	8.0	8.8	5.6	5.6	300 m	PCB feeding and stack testing continued
	S127	15:47	U	-03	15-30	NE	nd	det.	nd	nd	8.0	8.8	5.6	5.6	300 m	PCB feeding and stack testing continued
	S128	16:19	U	-03	15-25	NE	nd	nd	nd	nd	8.0	8.8	5.6	5.6	300 m	PCB feeding and stack testing continued
	S129	17:09	V	-04	10-20	ENE	nd	nd	nd	na	8.0	8.8	5.6	5.6	300 m	IS, PCB feeding and stack testing continued
	S130	17:45	V	-04	10-15	ENE	nd	nd	nd	nd	8.0	8.8	5.6	5.6	300 m	PCB feeding and stack testing continued
	S131	18:17	V	-04	05-15	ENE	nd	nd	nd	nd	8.0	8.8	5.6	5.6	300 m	PCB feeding and stack testing completed
Feb. 26	S132	12:25	G	02	00-15	N	nd	nd	nd	nd	9.6	8.1	5.5	4.4	300 m	Shredded capacitors and waste fuel fed for incineration
	S133	13:17	M	03	00-10	W	nd	nd	nd	nd	9.6	8.1	5.5	4.4	200 m	PCB feeding continued and stack testing commenced
	S134	13:49	N	01	00-05	WNW	nd	nd	nd	nd	9.6	8.1	5.5	4.4	200 m	PCB feeding and stack testing continued
	S135	14:21	N	01	00-05	WNW	nd	nd	nd	nd	9.6	8.1	5.5	4.4	200 m	PCB feeding and stack testing continued
	S136	14:53	N	01	00-05	WNW	nd	nd	nd	nd	9.6	8.1	5.5	4.4	200 m	PCB feeding and stack testing continued
	S137	15:32	N	-02	00-05	WNW	nd	nd	nd	na	9.6	8.1	5.5	4.4	200 m	IS, PCB feeding and stack testing continued
	S138	16:08	N	-02	00-05	WNW	nd	nd	nd	nd	9.6	8.1	5.5	4.4	200 m	PCB feeding and stack testing continued
	S139	16:40	N	-03	00-05	WNW	nd	nd	nd	nd	9.6	8.1	5.5	4.4	200 m	PCB feeding and stack testing continued
	S140	17:12	N	-05	00-05	WNW	nd	nd	nd	nd	9.6	8.1	5.5	4.4	200 m	PCB feeding and stack testing continued
	S141	17:44	N	-09	00-05	WNW	nd	nd	nd	nd	9.6	8.1	5.5	4.4	200 m	PCB feeding and stack testing continued
	S142	18:21	N	-10	00-05	WNW	nd	nd	nd	na	9.6	8.1	5.5	4.4	200 m	IS, PCB feeding and stack testing continued
	S143	18:58	N	-11	00-05	WNW	nd	nd	nd	nd	9.6	8.1	5.5	4.4	200 m	PCB feeding continued, stack testing completed
	S144	19:30	N	-12	00-05	WNW	nd	nd	nd	nd	9.6	8.1	5.5	4.4	200 m	PCB feeding continued

Table 2.3.1 (Cont'd)

Notes:
1. See Figure 2.3.1 for monitoring locations.
2. Met. conditions at 10 metres: AT=ambient temperature (°C); WS=range of wind speeds (km/hr); WD=predominant wind direction.
3. Quoted PCB concentrations (Conc.) are background subtracted for di-, tri-, tetra- and penta-chlorobiphenyl congener, and total refers to sum of all congeners.
4. Each quoted detection limit (DL) is the average detection limit of two parent/daughter ion pairs for di-, tri-, tetra- and penta-chlorobiphenyl congeners.
5. na=not available; IS=internal standard (deuterated tetra-chlorobiphenyl); spiked during downwind monitoring of di-, tri- and tetra-chlorobiphenyl congeners.
6. Dist.=distance from the incinerator to the monitoring site.
7. nd=not detected; det.=detected above total DL but below total quantitation limit (3.3xDL).

Table 2.4.1: Mobile TAGA 6000 Monitoring Results in Smithville (April 1991)
Selected PCB Congener Group Concentrations (Half-Hour Averages)

Date	Sample Number	Start Time	Site[1]	Met. Data[2] AT	WS	WD	PCB Conc.[3] (ng/m^3) di-	tri-	tetra-	penta-	Total	DL[4] (ng/m^3) di-	tri-	tetra-	penta-	Dist.[6]	Comments
Apr. 15	S01	13:41	A	14	10-40	S	57[7]	120	55	det	**230**	5.3	7.7	11	14	50 m	Incineration of PCB soil
	S02	14:20	A	15	30-60	SSW	50	96	44	det	**190**	5.3	7.7	11	14	50 m	Incineration of PCB soil
	S03	14:52	A	15	40-60	SSW	38	71	25	det	**130**	5.3	7.7	11	14	50 m	Incineration of PCB soil
	S04	15:24	A	16	50-90	SW	20	42	15	nd	**det**	5.3	7.7	11	14	50 m	Incineration of PCB soil
	S05	16:27	B	14	30-50	SW	48	99	42	na[5]	**190**	5.3	7.7	11	14	50 m	IS[5], incineration of PCB soil
Apr. 16	S06	10:51	C	13	40-60	WSW	28	67	36	det	**130**	5.3	5.1	5.4	7.6	75 m	Incineration of PCB soil
	S07	11:23	C	13	40-60	WSW	40	94	46	32	**210**	5.3	5.1	5.4	7.6	75 m	Incineration of PCB soil
	S08	11:55	C	14	40-60	WSW	47	120	69	61	**300**	5.3	5.1	5.4	7.6	75 m	Incineration of PCB soil
	S09	12:27	C	14	40-60	WSW	52	120	62	43	**280**	5.3	5.1	5.4	7.6	75 m	Incineration of PCB soil
	S10	13:23	C	15	30-50	WSW	48	100	50	na	**200**	5.3	5.1	5.4	7.6	75 m	IS, incineration of PCB soil
	S11	14:06	C	15	30-50	WSW	62	130	58	det	**250**	5.3	5.1	5.4	7.6	75 m	PCB soil feed stopped at 13:45
	S12	15:10	D	16	15-30	W	17	51	28	det	**96**	5.3	5.1	5.4	7.6	150 m	PCB soil feed resumed at 15:00
	S13	15:42	D	06	15-30	W	18	48	27	det	**93**	5.3	5.1	5.4	7.6	150 m	Incineration of PCB soil
Apr. 17	S14	10:56	E	09	15-25	N	nd	nd	nd	nd	**nd**	3.9	7.2	9.5	13	1/2 km	Incineration of PCB soil
	S15	11:28	E	09	10-25	N	nd	nd	nd	nd	**nd**	3.9	7.2	9.5	13	1/2 km	Incineration of PCB soil
	S16	12:00	E	09	10-20	NW	nd	nd	nd	nd	**nd**	3.9	7.2	9.5	13	1/2 km	Incineration of PCB soil
	S17	12:32	E	08	05-15	N	nd	nd	nd	nd	**nd**	3.9	7.2	9.5	13	1/2 km	Incineration of PCB soil
	S18	13:21	E	09	20-30	NW	nd	nd	nd	na	**nd**	3.9	7.2	9.5	13	1/2 km	IS, Incineration of PCB soil
	S19	14:20	C	09	10-20	W	67	110	46	det	**220**	3.9	7.2	9.5	13	75 m	Incineration of PCB soil
	S20	14:58	C	09	15-30	WNW	28	50	20	nd	**det**	3.9	7.2	9.5	13	75 m	PCB soil feed stopped at 15:06
	S21	15:31	C	09	15-30	WNW	47	88	37	nd	**170**	3.9	7.2	9.5	13	75 m	No PCB soil incineration
	S22	16:35	F	11	00-10	WNW	13	20	nd	nd	**nd**	3.9	7.2	9.5	13	200 m	No PCB soil incineration
	S23	17:07	F	08	05-10	N	nd	nd	nd	nd	**nd**	3.9	7.2	9.5	13	200 m	No PCB soil incineration

Table 2.4.1 (Cont'd)

Date	Sample Number	Start Time	Site[1]	Met. Data[2] AT	WS	WD	PCB Conc.[3] (ng/m³) di-	tri-	tetra-	penta-	Total	DL[4] (ng/m³) di-	tri-	tetra-	penta-	Dist.[6]	Comments
Apr. 19	S24	10:45	G	14	10-20	NNE	det	det	nd	nd	nd	4.2	5.3	5.1	9.1	250 m	Incineration of PCB soil
	S25	11:17	G	13	05-15	NNE	nd	det	nd	nd	nd	4.2	5.3	5.1	9.1	250 m	Incineration of PCB soil
	S26	12:10	H	11	30-40	NNE	det	24	det	nd	det	4.2	5.3	5.1	9.1	300 m	Incineration of PCB soil
	S27	12:46	H	11	20-40	NNE	det	22	det	na	det	4.2	5.3	5.1	9.1	300 m	IS, incineration of PCB soil
	S28	13:18	H	11	20-40	NNE	det	20	det	na	det	4.2	5.3	5.1	9.1	300 m	IS, PCB soil feed stopped at 13:00

Notes:
1. See Figure 2.4.1 for monitoring locations.
2. Met. conditions at 10 metres: AT=ambient temperature (°C); WS=range of wind speeds (km/hr); WD=predominant wind direction.
3. Quoted PCB concentrations (Conc.) are background subtracted for di-, tri-, tetra- and penta-chlorobiphenyl congener, and total refers to sum of all congeners.
4. Each quoted detection limit (DL) is the average detection limit of two parent/daughter ion pairs for di-, tri-, tetra- and penta-chlorobiphenyl congeners.
5. na=not available; IS=internal standard (deuterated tetra-chlorobiphenyl); spiked during downwind monitoring of di-, tri- and tetra-chlorobiphenyl congeners.
6. Dist.=distance from the incinerator to the monitoring site.
7. nd=not detected; det.=detected above total DL but below total quantitation limit (3.3xDL).

Table 2.5.1: Mobile TAGA 6000 Monitoring Results in Smithville (April 1993)
Selected PCB Congener Group Concentrations (Half-Hour Averages)

Date	Sample Number	Start Time	Site[1]	Met.[2] AT	Met.[2] WS	Met.[2] WD	total[3] PCBs	DL[4] di-	DL[4] tri-	DL[4] tetra-	DL[4] penta-	Comment
Apr.19	S01	15:16	A	09	30-45	NE	nd[5]	11	14	28	52	Downwind
	S02	16:07	B	08	35-45	NE	nd	11	14	28	52	Upwind
Apr.20	S03	10:25	C	10	30-45	SSW	nd	11	14	13	20	Upwind
	S04	11:35	D	13	35-55	SSW	nd	11	14	13	20	Downwind
	S05	12:15	D	15	50-65	SW	nd	11	14	13	20	Downwind
	S06	13:10	D	16	45-60	SW	nd	11	14	13	20	Downwind
	S07	13:41	D	16	40-65	SW	nd	11	14	13	20	Downwind
	S08	14:26	D	17	45-70	SW	nd	11	14	13	20	Downwind
	S09	15:07	D	17	40-65	SW	nd	11	14	13	20	Downwind
	S10	16:12	D	15	45-65	SW	nd	11	14	13	20	Downwind
Apr.21	S11	08:44	E	-01	10-20	NNW	nd	5.9	11	23	11	Upwind
	S12	10:56	F	-01	25-30	NNW	nd	5.9	11	23	11	Downwind
	S13	11:44	F	00	25-30	NNW	nd	5.9	11	23	11	Downwind
	S14	12:26	F	00	30-40	NNW	nd	5.9	11	23	11	Downwind
	S15	13:14	F	00	25-40	NNW	nd	5.9	11	23	11	Downwind
	S16	13:45	F	00	15-30	NNW	nd	5.9	11	23	11	Downwind
	S17	14:51	G	00	20-30	N	nd	5.9	11	23	11	Downwind
	S18	15:22	G	00	20-35	N	nd	5.9	11	23	11	Downwind
Apr.22	S19	09:26	B	02	20-35	N	nd	21	24	11	15	Upwind
	S20	11:00	H	07	20-30	N	nd	21	24	11	15	Downwind
	S21	11:40	H	08	15-35	N	nd	21	24	11	15	Downwind
	S22	12:33	I	10	40-60	N	nd	21	24	11	15	Downwind
	S23	13:20	I	09	45-55	N	nd	21	24	11	15	Downwind
	S24	14:01	I	10	35-50	N	nd	21	24	11	15	Downwind
	S25	14:41	I	10	40-50	N	nd	21	24	11	15	Downwind
	S26	15:30	J	11	30-50	N	nd	21	24	11	15	Downwind
	S27	16:10	J	12	20-40	N	nd	21	24	11	15	Downwind
Apr.23	S28	09:35	K	12	30-45	NNW	nd	13	9.2	22	29	Upwind
	S29	10:31	C	13	15-25	NNW	nd	13	9.2	22	29	Downwind
	S30	11:10	C	14	10-25	NNW	nd	13	9.2	22	29	Downwind

Notes: 1. See Figure 2.5.1 for monitoring locations.
2. Meteorological conditions: AT = ambient temperature (°C); WS = range of wind speeds (km/hr); WD = predominant wind direction.
3. in ng/m^3; total PCBs are sum of di-, tri-, tetra- and penta-chlorobiphenyl congeners.
4. in ng/m^3; is the average detection limit of two parent/daughter ion pairs for each congener.
5. nd = not detected.